SaMERU

Final Technical Report

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SaMERU
SAFER MOBILITY FOR ELDERLY ROAD USERS

Project co-ordinator

southend onsea
BOROUGH COUNCIL

SaMERU - Safer Mobility for Elderly Road Users

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The table below indicates the partners responsible for leading the Work Packages

Table 1 – Work Package Activites and Responsibilities

Description of Activity	Southend	Burgos	IFSTTAR	Lancashire	Modena	TUD
WP1 Review of Relevant Published information						✓
WP1 Stakeholder Consultation	✓					
WP1 Review Medical, Psychological, Sociological Factors			✓			
WP2 Accident Trends					✓	
WP2 Pedestrian Accidents				✓		
WP2 Review of Risks			✓			
WP2 Motorcyclists		✓				
WP2 Drivers						✓
WP2 Traffic Offences					✓	
WP3 Public Space Ergonomics	✓					
WP3 Highway Environment	✓					
WP4 Accident Investigation				✓		
WP5 Access to Public Transport		✓				
WP5 Cyclists		✓				
WP5 Mobility Scooters	✓					
WP6 Publicity and the Media	✓					
WP6 Training and Awareness Workshops				✓		
WP6 Targeted Messages					✓	
WP7 Communication	✓					

This report includes a summary of each work package. Further information relating to the work packages is available at www.sameru.eu

This final report will be supplemented with the individual work package partner actions that have been combined in this final text. These will be available on the SaMERU website and comprise a wealth of additional information for readers to analyse, use and respond to. It is not possible within the practical limitations of this report to include all of this additional information.

The project partners wish to express their utmost thanks to the stakeholder organisations, technical experts and the many individuals that have contributed to SaMERU. This support, advice, challenge and cooperation has been essential in producing this report and the final recommendations. It is hoped that this dialogue will continue further through ongoing work with the local authorities, partners and at a national and European Union (EU) level.

Introduction

The Purpose of this Report

This report provides practical guidance that national and local highway authorities may wish to consider adopting in order to reduce the risk of injury to elderly road users. We hope that it will encourage road safety practitioners to consider the issues facing older road users from a different perspective. We believe more thought should be given to the design of urban space, road junctions and traffic signs to reduce the risk of collisions involving older people. This report recommends suitable alternatives to driving, promoting safer practices through education, publicity and training. We emphasise a positive vision of ageing by highlighting the capacity of people to compensate for age-related declines and adapt to new situations by self-regulating their behaviour on the road.

The issue of fitness to drive is a sensitive subject and we make suggestions that should reduce the risk to the older road user. However, much work still needs to be done in relation to the effects of medication on the safety of older road users and we trust that this report will help to accelerate research in this area. Most published work is about driving and more research is therefore needed in walking, cycling and the use of buses by older people.

During the course of our work, we have noted the importance of the link between mobility and health. Improved mobility can reduce isolation and loneliness amongst older people and greatly improve their quality of life. We hope SaMERU will help to generate closer co-operation between road safety practitioners and health professionals, which will be for the benefit of everybody.

We have covered a wide range of factors that affect the road safety of older people. However, we have also identified areas where information is sparse and we trust that future researchers will help to fill the gaps in our knowledge and further add to the safety of older road users.

Finally, we hope this report will encourage debate across Europe and that people will contact us with their ideas to further add to the safety of the elderly road user. Contact may be made via our website www.sameru.eu alternatively, you may contact any of the partners listed at the beginning of this report.

A Brief Outline of SaMERU

SaMERU was 50% co-funded by the European Commission's Directorate-General for Mobility and Transport. The balance of funding was provided by the six partners shown below, all of which have substantial experience of developing European funded highways and transportation projects:

1. **Southend-on-Sea Borough Council (UK) Project Co-ordinator.** Southend has a population of 160,000 and is located in South-East England on the north side of the Thames estuary. The town is becoming a retirement destination of choice for elderly people who value its seaside location and good facilities. Southend was a

partner in BAPTS Boosting Advanced Public Transport Systems – Interreg IVB NW Europe and Bike Friendly Cities, an Interreg 2 Seas project.

2. **City of Burgos (Spain).** Burgos is a city of 170,000 inhabitants located in the north-central part of Spain in the region of Castilla-León. From 2005, Burgos participated in the CIVITAS II initiative and has developed many measures to improve mobility including pedestrianisation, cycle lanes and bus priority measures.

3. **The French Institute of Science & Technology for Transport, Development and Networks (IFSTTAR) (France).** IFSTTAR's mission is to conduct applied research projects, offer consultancy services, promote innovation transfers, develop certification standards, establish technical guidelines and develop public policy, knowledge dissemination and training.

4. **Lancashire County Council (UK).** Lancashire is located in the North-West of England and has a population of 1.2 million. It is the upper-tier local authority for the non-metropolitan county of Lancashire. The county has been at the forefront of innovation in highways and transportation since the 1950's when it was responsible for the UK's first motorway, the M6 Preston bypass.

5. **City of Modena (Italy).** Modena is a city of 185,000 inhabitants, located in Northern Italy at the heart of the Emilia-Romagna region. Since 2002, the City of Modena has operated in four macro-areas of road safety interventions through the Safety Policy Office of the Municipal Police Department. These include; monitoring and analysis of road accidents, enforcement, promotion of a road safety culture and implementation of engineering improvements to the highway.

6. **Technical University of Dresden (Germany).** In 2012, the university was declared one of eleven German Universities of Excellence. It has 36,500 students and is the largest university in the Saxony region. The university has five schools; Mathematics/Natural Sciences, Humanities & Social Sciences, Engineering Sciences, Civil/Environmental Engineering and a Medical School.

The SaMERU consortium of local authorities and research establishments was assembled in order to provide comprehensive information about all the principal factors that influence the safety of elderly road users.

At the outset, we developed a strategy of involving older residents of Southend, Burgos, Lancashire and Modena directly in the project. They have responded to questionnaires, completed travel diaries, attended workshops, participated in street events and attended our final conference. This strategy has given us an insight into their mobility concerns and has encouraged them to put forward their own suggestions for improving safety. From feedback received, we believe we have succeeded in giving them ownership of our project and we thank them for their contributions.

A medical, psychological and sociological review has been undertaken by our research partners, which included changes with increasing age in sensory, motor and cognitive functions as well as the possibilities of compensation in older road users.

We have commissioned the services of recognised experts to assist with certain specialised subjects and should like to thank Social Research Associates for the survey of elderly pedestrians in Southend and Lancashire and Emeritus Professor Stephen Stradling of Edinburgh Napier University for reviewing our statistical results. We should also like to thank Professor Dr Bernhard Schlag, Chair of Traffic and Transportation Psychology at the Technical University of Dresden, for his valuable input in the area of behavioural change. The City of Modena also thanks its Research Office for its work on the questionnaires at a local level.

Later in this report, we outline policy changes that have been adopted by our four local authority partners as a direct result of SaMERU and which will continue to benefit older people in the years to come.

Background to SaMERU

Road safety is a major societal issue. In 2009, more than 35,000 people died on the roads of the European Union and elderly people represented 20% of these fatalities

Improving the safety and mobility of older people has become a crucial issue in developed countries. It is recognised that we are living longer and our desire to remain mobile in our later years is increasing. For example, people over the age of 65 are remaining economically active and therefore require access to their work place, often by car. They frequently take on the role of carers for family and friends and may be asked to provide additional support in respect of child care.

Older road users are the fastest growing of all age groups in Organisation for Economic Co-operation and Development (OECD) countries where more than 25% of people will be over 65 years of age by 2050. Among them, the number of people over 85 years of age is expected to increase from 4% of the population in 2010 to nearly 10% by 2050.

Based on collisions per kilometre driven, those older than 85 years are the second highest risk group; those under 20 years are the highest risk (Loughran, et al., 2007). In France, people over 65 years of age account for 51% of all pedestrian fatalities but form less than 15% of the population. In Italy, fatal road injuries are highest in the 80-84 age group and seriously injured are highest in the 70-74 age group.

When older road users are involved in collisions, the risk of serious or fatal injury is higher due to increased frailty with age.

Older people recognise that using alternative modes of transport to the car can help them remain mobile when driving becomes difficult due to cognitive and other ageing issues.

Living longer also presents challenges, which include increasing health care costs and pressures on state services. The design of future adult care support measures will impact on mobility and the need to seek ongoing social interaction at home.

Continued dependence on the car as our principal means of transport, has safety and mobility issues as we become older. A reduction in mobility can result in increasing feelings of isolation, loneliness, depression, reduced physical and mental health leading to a poorer quality of life.

The safety and mobility of elderly road users are challenged by several age-related changes, including sensorial, physical, cognitive and meta-cognitive abilities, as well as by medication and alcohol intake. Sociological factors also play a part, for example income and living environment. Local authorities and national governments have to face these substantial challenges to develop integrated approaches that support safety and mobility. Actions include the development of safer roads and infrastructure, vehicle design and new technology, public transport options and the promotion of safer practices through education, publicity and training programmes.

From this background we proposed the following recommendations:

Recommendations

These recommendations have been formulated by the project partners and take into account the information we have collected from stakeholders through our surveys and discussion with delegates at our Final SaMERU Conference. Our recommendations also take into account recent research that has been carried out into the elderly road user in Europe and elsewhere.

The recommendations have been grouped into three sets; Principal Recommendations, Recommended Good Practice and Recommendations for Future Research. The Principal Recommendations are of a generic nature and provide the foundations upon which the more detailed Good Practice Recommendations are based. The recommendations for future research are the result of a comprehensive assessment of the literature concerning the elderly road user, which revealed significant gaps in knowledge.

The recommendations are supported by the SaMERU Work Packages and readers of this report may refer to Table 2 in order to discover the background to our recommendations.

Principal Recommendations

PR1. Action must be taken to co-ordinate transportation, social and health services to enable older people with diverse needs to remain mobile and to enjoy a good quality of life with access to services, education, work, leisure and recreation.

PR2. Giving up driving is a sensitive issue as it can often have a major impact on mobility and independence. There must be encouragement and funding for European, national and local authorities to develop training and support programmes for older drivers to enable them to continue driving safely for as long as they are able, to reduce their dependence on the car and encourage the use of other means of transport. Older people who have ceased driving for health reasons should be supported in using public transport, walking and cycling and provided with the necessary training and advice in the use of other modes of transport.

PR3. Initiatives to encourage the use of public transport, walking, cycling and taxis should target pre, as well as post, retirement age groups and should highlight the significant health and long term independence benefits alongside safety advice.

PR4. Fitness to drive is an area for further detailed work to establish appropriate standards that may be applied consistently across the EU. These standards should be publically acceptable and medically appropriate for drivers with widely different physical and cognitive abilities. Age should not be considered a barrier to driving as people have very different driving abilities. Support, training and involvement by the medical profession, families, the Police and other agencies must be provided and sought to fully understand the implications of any policy changes.

PR5. The method of recording and analysing road accidents should be standardised across all the EU. This would enable accurate monitoring of trends and would make it possible to compare the effectiveness of actions to improve safety and also identify possible causes of accidents involving older people.

PR6. Guidelines should be developed and adopted across the EU to improve the design and maintenance of streets with the required facilities to be audited by highway and transportation authorities for safety and ease of use by all older pedestrians, cyclists and drivers. In the past, the design and maintenance of streets has rarely taken full account of the mobility difficulties faced by older people.

PR7. Pedestrians – strong stakeholder views have been expressed about the inappropriate and inconsiderate use of footways and pedestrian areas by cyclists, parked vehicles and mobility scooters. There is a need for enforcement and encouragement for other users to consider the needs of older pedestrians who are fearful of being involved in an accident. Footways of appropriate width and adequately maintained for the older user must be considered in design and maintenance regimes.

PR8. Advanced Driver Assistance Systems (ADAS) can assist the driver by increasing safety and comfort in complex traffic situations. It is recommended that steps are taken to further develop ADAS for the specific needs and capabilities of older drivers.

PR9. Promotion of road safety messages, information and guidance is very important for all age groups, to develop an inter-generational understanding and awareness of the needs, limitations and potential of each generation. In particular, the active role of older citizens in society should be promoted.

Recommended Good Practice

Guidelines to be Developed and Considered for Adoption Across EU Member States to Improve Conditions for Elderly Road Users

Street Environment

GP1. Residential, shopping and recreational environments should be made to appear different from areas where vehicles predominate. The different environment should indicate to drivers that they must slow down and give priority to pedestrians and cyclists. The introduction of 30kph (20mph) speed limits should be considered to help achieve an improved environment for the elderly, particularly in respect of reaction times for drivers and time to cross the road for pedestrians. The effectiveness of these measures and their acceptance by the public should be underpinned by selecting high-risk locations with a history of collisions or where the presence of traffic has created environmental problems.

GP2. Street clutter, in particular superfluous signage and obstructions like 'sandwich board' (A Board) advertisements, should be removed because they confuse older pedestrians and create potential hazards that increase the risk of falls.

GP3. All proposals to create shared surfaces where vehicles and pedestrians have joint use should take into account the views of elderly people and those who are blind or partially sighted.

Driving

GP4. To make driving easier and safer for the elderly after dark, the reflectivity of traffic signs and road markings should be increased together with improved street lighting utilising new sources of white light including LEDs.

GP5. Protected left-turn lanes (right-turn in the UK, Ireland, Malta and Cyprus), wider carriageway lanes, raised islands, larger sign symbols and lettering at junctions should be provided to assist elderly drivers.

Pedestrians

GP6. Older pedestrians expressed strong views at the presence of cyclists in the footway and pedestrianised areas. Enforcement is needed to address this, together with careful design of infrastructure. But of equal importance; cyclists need to be made aware of the problem through peer to peer training and publicity.

GP7. Pedestrian refuges should be provided at pedestrian crossings to allow crossing in two stages. Other improvements should include kerb extensions to reduce the time of exposure to traffic on the carriageway. Bollards and fencing, combined with better street design, should be provided to prevent pedestrians being obstructed by parked vehicles. Improvements to the quality of footway and pedestrian crossing surfaces including avoiding abrupt changes in level should be provided to reduce the risk of falls.

GP8. Technical approval authorities in the Member States should consider the provision of countdown signals at road junctions and crossings together with audible signals/warnings to inform pedestrians of the duration of their priority crossing time. At controlled pedestrian crossings, electronic detectors that track crossing movements of pedestrians should be provided. These are already incorporated in PUFFIN (Pedestrian User Friendly Intelligent) crossings in the UK and automatically allow crossing times to match the speed of crossing pedestrians. This type of crossing has been shown to reduce collisions. Stakeholders also requested that countdown facilities be installed to give more certainty regarding the time they have to cross the road. Explaining how these crossings work and the underlying principles is vital because many stakeholders were not aware of the new features.

Cyclists

GP9. Additional lanes should be provided at junctions to reduce conflicts between cyclists and vehicles, particularly heavy vehicles. Segregated cycle tracks should be provided in urban areas to avoid conflicts on roads that are heavily trafficked. Developing cycle training, advice, support programmes and appropriate infrastructure with older stakeholders is very important. The type of bicycle that is used and advice on selection is also important. The use of electric bikes for older people should be investigated further.

Car Design

GP10. It is recommended that the design of cars is made more age-friendly in the following areas; height of door frame, width of door aperture, height of the sill above the ground, depth of sill, seat height and hand-holds on the door frame to facilitate access and egress by older people. Seat design should generally be flat, so as to facilitate sit down and comfortable movements once in the vehicle. Rear pillar obscuration must be minimised to reduce 'blind' spots.

GP11. The design of handles, knobs and the steering wheel should be adapted to mitigate the limitations often encountered by adults suffering from arthritis.

GP12. Full-size spare wheels should be provided as standard equipment on all cars and the tools to remove and re-fit wheels should be designed to incorporate sufficient leverage for an older person to easily operate them.

GP13. Ease of driving should be improved by incorporating power steering on all cars and automatic transmission should be available as an option on all models.

GP14. Radios should be designed to incorporate controls that are simple to operate while driving in order to limit the amount of distraction that is often the case with over-complex modern radios.

GP15. Driver assistance technologies should de designed to improve safety for the elderly driver. For example, the provision of blind spot warning systems, lane keeping assistance, collision mitigation braking can all partly compensate for age-related declines and should be included either as standard equipment or as an option on all models. Advanced driver assistance systems should be developed in full consultation with elderly drivers and experts on ageing.

Bus Passengers

GP16. Navigational aids to assist older passengers should be provided including visual and audio systems giving the name of the next stop inside the bus and the time of the next bus at bus stops.

GP17. Demand responsive flexible transport services that allow flexible routeing and scheduling using smaller sized vehicles in shared ride mode between pick-up and drop-off locations should be offered.

GP18. Low-floor buses should be available on all routes and ramps provided for passengers with severe mobility difficulties. Adequate storage for wheelchairs should be provided.

GP19. Driver training should be designed to assist the older passenger and should include attention to gentle acceleration and deceleration and not moving off until all passengers are seated. Driver performance should be regularly monitored to ensure high standards are maintained.

Education, Publicity & Training

GP20. Public awareness of the mobility needs and safety difficulties experienced by older people should be raised through education at school, during driving lessons and through media campaigns. Education and publicity should also be aimed at older road users to help them become aware of the risks they encounter with increasing age. The medical profession should promote local training courses that are aimed at improving the mobility of older people.

GP21. On-road training, in-class education, physical exercise and cognitive training programmes that target specific skills involved in driving, crossing the road, using public transport and cycling should be made available to elderly road users.

GP22. Local highway authorities should consider introducing a safer driver training course based on the models piloted by Lancashire County Council and the City of Modena, details of which are included in this report.

GP23. Age-based assessments have been implemented in some countries but research has revealed that their effectiveness is unclear; they are unlikely to produce safety benefits and could have a counter-productive effect on the mobility of elderly road users. It is therefore recommended that other methods of assessment should be employed, such as driver evaluations on the road.

Data Collection

GP24. Partnership working amongst local authorities, the emergency services, the health sector and insurance companies should be developed and a protocol agreed for road collision data sharing.

GP25. Training – one of the barriers to accurate reporting is a lack of understanding by the police of the value of collision data and the benefits to society in terms of reducing the number of victims and hence the misery suffered and also the cost to public health services. Better training and motivation of police forces is required in order to improve data accuracy and reduce the time taken to enter collision data onto databases.

GP26. Quality improvement – under reporting is the biggest challenge to collision data integrity. Local highway authorities should undertake studies into data quality in order to identify areas for improvement.

GP27. In order to more accurately assess injury severity, medical practitioners, local hospitals and public health practitioners should be encouraged to work together on data sharing protocols, especially in the area of falls prevention because, although some information is collected, it does not always appear alongside more recognised accident data. A more accurate assessment of injury severity could be achieved by collecting more data from the emergency services, hospitals and insurance companies.

GP28. Public access to information – road collision and casualty data should be available on the internet in order that interested professionals and the public may study it and undertake their own analyses.

Recommendations for Future Research

FR1. Research into the elderly road user is currently dominated by publications dealing with driving. More research is needed into the elderly road user as a pedestrian, cyclist and bus user.

FR2. More research is needed to identify changes to road infrastructure that could allow greater safety for older pedestrians and cyclists without impairing the mobility of other road users.

FR3. Currently available methodology is only capable of satisfactorily testing high risk elderly drivers suffering from serious sensorial or cognitive declines. It is therefore necessary to develop and put in place improved regular and systematic tests of ability for elderly drivers.

FR4. Follow-up studies are needed to evaluate the long-term effectiveness of the pictograms, 'Danger do not drive', 'Be very careful', 'Be careful' shown on the packaging of French medication in order that this system may be considered for adoption in other countries.

FR5. As elderly people are more sensitive than other adults to the psychoactive effects of alcohol it is necessary to study whether lower limits of blood alcohol content should apply to older drivers.

FR6. Our work with IFSTTAR has provided evidence that a modal shift away from the car to more sustainable forms of transport could help older people become safer, more independent, less isolated and healthier, thereby reducing demands on health services. More research is needed in this area particularly with regard to the practical issues of accessibility to public transport services, cycling, walking, the highway environment and the effect on the levels of fitness and wellbeing of older people.

Table 2 – Recommendations relating to work packages

Recommendation	WP1	WP2	WP3	WP4	WP5	WP6	WP7
PR1	✓						✓
PR2	✓						✓
PR3	✓						
PR4	✓						✓
PR5		✓		✓			
PR6	✓						✓
PR7	✓		✓				✓
PR8	✓						
PR9						✓	✓
GP1	✓		✓				✓
GP2	✓		✓				✓
GP3	✓		✓				✓
GP4	✓						
GP5	✓						
GP6	✓		✓				✓
GP7	✓		✓				✓
GP8	✓						✓
GP9	✓		✓				
GP10	✓						
GP11	✓						
GP12	✓						
GP13	✓						
GP14	✓						
GP15	✓						
GP16					✓		
GP17					✓		
GP18					✓		
GP19					✓		✓
GP20						✓	✓
GP21						✓	✓
GP22						✓	
GP23	✓						
GP24		✓		✓		✓	
GP25	✓				✓	✓	
GP26		✓		✓		✓	
GP27	✓	✓		✓		✓	
GP28		✓		✓		✓	
FR1	✓	✓					
FR2	✓						
FR3	✓						
FR4	✓						
FR5	✓						
FR6	✓	✓					

Policy changes attributable to SaMERU in the partner authorities of Burgos, Lancashire, Modena and Southend

The table below shows policies the local authority partners have developed during the SaMERU project and proposed actions to develop these policies further after SaMERU has been completed.

Table 3 – Policy changes attributable to SaMERU

During the SaMERU Project	After the SaMERU Project
Burgos	
As a result of surveys, implemented segregated bike lanes.	Continue with implementation of segregated bike lanes.
Implement safety and security elements at crossings where there are a high number of collisions. To include visible countdown clocks to inform pedestrians of how much time they have to cross and to implement LED lights to clearly display the colour of the traffic signal.	Continue with the implementation of countdown clocks, LED lights.
Implement intelligent signalised crossings that automatically detect the presence of pedestrians and provide extended crossing times when necessary.	Continue with the implementation of automatic pedestrian detection at signalised crossings.
	Investigate the introduction of zebra crossings to aid pedestrians, in particular, older pedestrians.
	Tailor road safety training programmes to the individual needs of older road users.
Lancashire	
Driver Training Courses – using the Drive Safely for Longer model.	Targeting older drivers in greatest need of training through healthcare practitioners, families & popular media.
Adult Cycle Training Courses – delivered free and at the resident's preferred location.	Advice for older cyclists and case studies.
Help direct 'information road shows' giving advice and printed information in the residents' locality.	Advice for family & friends.
'Bus Hailer' scheme for alerting bus drivers that a visually impaired person needs to be collected.	Advice for healthcare practitioners.
	Pre-retirement courses.
	Development of car share system for older residents in rural areas
	Exploring potential for increased use of taxis.
Modena	
A study was undertaken to identify the effects of diseases and medication on elderly road user safety.	Implementation of a monitoring system to record data relating specifically to the older road user.
Practical training on safe driving was undertaken through ad hoc courses.	Implementation of training courses, both practical and theoretical.

Information workshops on road safety were organised. The Municipal Police distributed information on the Highway Code at a stand in the City.	Regular information workshops within city squares, where City Police deliver information on the Highway Code and useful information on safer mobility on the road.
	The development of communication and marketing campaigns to consider the suggestions that arose during the Focus Group and the surveys implemented during the SaMERU project.
Southend	
Engage with older persons community groups including the Older Peoples Assembly and colleagues in social care.	Update the Third Local Transport Plan (LTP3) to include strategies for older people.
Hold cycle training sessions for older people. During the SaMERU project 'Get back to Cycling' sessions for older people have been run.	Continue with cycle training schemes for older people.
Maintain the highways and footways better to reduce the number of potholes.	Improve the maintenance of highways and footways.
	Investigate the redesign of tactile paving as surveys showed that older pedestrians, especially those with arthritis, find it painful to walk on.
	Encourage bus companies to design buses to take into account the needs of the elderly e.g. easy reach rails, non slip floors, bus numbers on all sides of the bus and timetables of other bus services at bus stops.
	Introduce longer pedestrian crossing times at signalised crossings and the introduction of visible countdown clocks to inform pedestrians of how much time they have to cross.

Work Package 1 - Information gathering

Actions 1.1 – 1.2: Review of Relevant Published Information

Introduction

The purpose of this section of the report is to provide the reader with a list of publications that covers the principal issues affecting the safer mobility of elderly road users. A more comprehensive list of publications with brief abstracts is available on our website www.sameru.eu

In order to facilitate a search for documents, we have adopted a system called Mendeley. This is a web-based database service that allows the creation of a bibliography in specific subject areas, organises references and documents and edits references in common text-programs. There are two versions of Mendeley; one is the browser version and the other is the desktop version. Both are interlinked and can be manually updated to include the same information. The desktop version is needed because it has MS Word and OpenOffice Writer plugins. The browser version is to search for and update references in the bibliography.

Due to the web-based nature of Mendeley, a user name and password are required to access a specific bibliography. In order to prevent unauthorised access and yet allow the public to benefit from the research conducted in SaMERU, another option was chosen. By joining a group in Mendeley, external users may search the database associated with this group and they can even download it to a local computer for further usage. Thus, a SaMERU group was created which can be accessed by:

- Visiting www.mendeley.com
- Choosing the "Groups" Tab
- Searching for the "SaMERU - Safer Mobility for Elderly Drivers" Group.

After having found the group you can research and download the bibliography for your own purposes. However, the original web-based database cannot be modified in this way. If modification and extension of the original database is needed, this can easily be done via the SaMERU Co-ordinator or a SaMERU partner having access to username and password.

A series of slides has been produced that describe in detail how to use Mendeley. Although they were created for the benefit of the project partners, they can also be used for those who want to download the bibliography from the SaMERU-Group. These instructions may be found by visiting www.sameru.eu

Literature Review

Demographic Change and its Impact on Traffic

The generations aged 65 plus are keeping their driving licences longer and are driving more kilometres than previous cohorts (Berry, 2011). That is to say: the population is ageing but at the same time mobility is increasing. Therefore the age structure of the driving population is altering and the average age of the licence holders is increasing. Senior drivers (65+) represent the fastest growing part of the driving population in industrialised countries (Siren

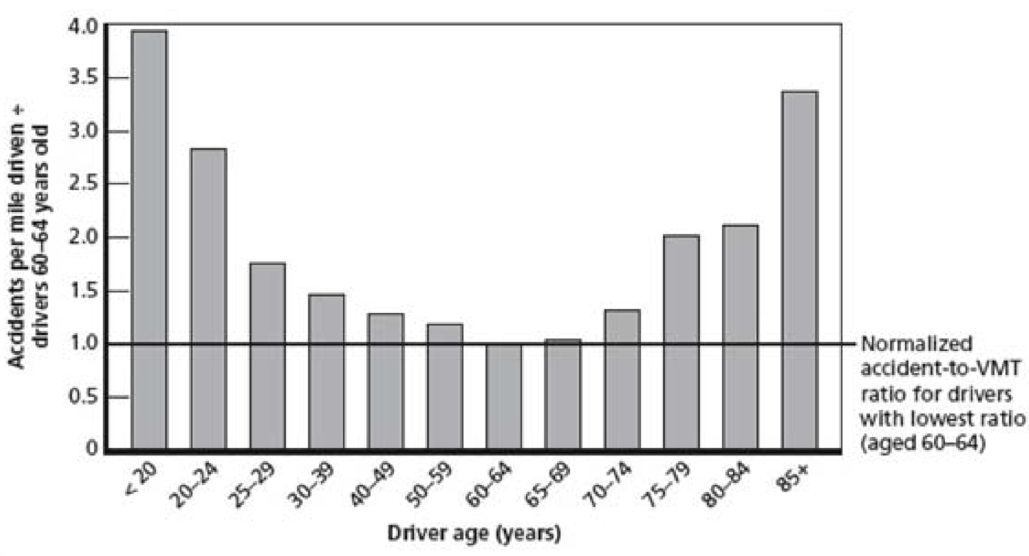
& Kjær, 2011). For example, in 2030, a quarter of all drivers will be aged 65 and above in Europe (OECD, 2001).

In the U.S., the number of elderly licensed drivers is also expected to grow over the coming years. The Institute for Highway Safety in the U.S. predicts that one out of every four licensed drivers will be older than 65 years by the year 2029. The constant trend of being more and more mobile can be seen by the fact, that, according to NHST data in 1990 only 36% of 85-95 year old drivers drove a car, whereas in 2001 about 45% still drove themselves. By 2050, half of the 70 million older drivers (65+) will be over the age of 75.

Collisions Involving Elderly Road Users - Specific Groups
Traffic situations are often related to a social system and elderly road users represent a specific group within this system. The road safety of older road users is, to a large extent, affected by the following two factors: physical vulnerability on the one hand and functional limitations on the other. From this it follows that traffic experts have to pay special attention to elderly road users. Whereas most research deals with elderly drivers, other road users should also be kept in mind. This is especially the case for pedestrians, cyclists and to a lesser extent, motorcyclists. Because of the absence of physical protection, they are often subsumed under the category "vulnerable road users". Due to the lack of passive safety and the difference in mass when colliding with a motorised vehicle, their risk of being seriously injured or killed in an accident is very high (Shinar, 2007). Whereas all vulnerable road users are affected by the lack of protection, elderly road users are particularly affected because of their increased frailty.

Collisions Involving Elderly Road Users - Specific Issues
It is often claimed that elderly drivers have an increased collision risk due to different impairments in functional abilities. This association is supported by analysis of data, where collision rates of older, middle-aged and younger drivers are compared. This data clearly shows a higher collision risk per mile driven for the eldest and youngest drivers. When the number of accidents is referenced to distance or time driven, this is called the bath-tub function results (Schade, 2000, see also Figure 1).

Figure 1: Accidents per Mile Driven, by Driver Age (Loughran, et al., 2007).



A closer look at the data reveals that drivers aged 60 to 64 years do not have an increased risk of being involved in accidents, in fact they have the lowest accident rates of all age groups. In contrast, young drivers show a three times higher risk of being involved in an accident than this older age group. However, it is only from the age of 75 plus that the accident risk increases significantly. Another sharp increase may be observed from the age of 85 years upwards (Loughran & Seabury, 2007).
When analysing collision rates or fatalities of elderly drivers, two modifying aspects should be kept in mind:

- the effect of increased frailty and ("frailty bias")
- the effect of low mileage driven ("low mileage bias").

Traffic Offences
Traffic offences involving elderly people show two different developments. Offences such as speeding or driving under the influence of alcohol decline with age, whereas offences due to driving errors increase. That is to say, elderly drivers demonstrate more driving errors rather than driving violations (Schade, 2007). Typical violations involving elderly drivers include disregarding the right of way, road rules or red traffic lights and errors when turning or reversing. In contrast, they are less likely to drive without a licence or insurance, have less speed violations and drive less often under the influence of alcohol.

Solutions for Safer Mobility for the Elderly
The elderly are a very heterogeneous group, displaying different kinds of impairments with different characteristics and thus, will benefit from different measures to maintain their mobility. To stay mobile as long as possible, different measures are available, such as, cognitive training, use of adaptive car technology and modified road design.

Rehabilitation programmes aim to regain a former state or improve a present state of ability and may include fitness training as well as cognitive training. Fitness training programmes aim to improve the range of mobility, strength and endurance. Different studies have investigated the effects of fitness training on driving performance (Eby, Molnar & Kartje, 2009).

Findings on the effect of cognitive training on fitness to drive can be diverse. Results depend not only on the quality of the training, but also on its frequency and specific fit to the declines. According to the latest findings, cognitive training must be tailored to a specific deficit and, provided this is adhered to, it has a greater impact on improving fitness to drive than generic fitness training.

In addition to the improvement of driver skills, improved road design can play a part in reducing the risk of collisions. Junctions represent a high collision risk for elderly drivers, so different countermeasures such as protected left-turn lanes (right-turn in the UK) and improved carriageway markings can be implemented to assist elderly drivers (Eby, Molnar & Kartje, 2009). Similar countermeasures can be found for other difficult situations.

Another way to improve safer mobility for elderly drivers is to design vehicles and mobility-related technology in a way that takes into consideration age-related changes in abilities. Well-thought-out design can support older road users during critical driving manoeuvres and, in general, can simplify driving tasks.

Key European Legislation Relating to SaMERU

The table below summarises the current EU legislation that affects the elderly road user. If the SaMERU recommendations were to be adopted by the EU it may be seen that, in some cases, additional legislation would be needed to ensure that any changes are legally enforceable.

Table 4 - Key European Legislation

Key EU Legislation	Treaty Base in Treaty on the Functioning of the European Union (TFEU)	Description
First Council Directive 80/1263 EEC of 4 December 1980 on the introduction of a Community driving licence. (First driving licence directive)	Article 95 (ex. Article 75)	This sets standards across the EU and allows mutual recognition of driving licences.
Directive 1999/37/EC – the harmonisation of registration documents for vehicles	Article 95 (ex. Article 75)	This legislation aims to harmonise the documentation underpinning the vehicle registration system across the EU. That system is designed to ensure that, before a vehicle can be used on a road, a check is made that it fulfils all the relevant type or individual approval requirements guaranteeing an optimal level of safety and environmental standards
Directive 2005/36/EC (Recognition of professional qualifications)	Article 46 (ex. Article 40), Article 53 (ex. Article 47), Article 62 (ex. Article 55)	Driving instruction is not regulated by EU legislation but these Directives allow qualified driving instructors to practice in any Member State.
Directive 2008/96/EC on road infrastructure safety management	Article 91 (ex. Article 71)	The infrastructure directive places various requirements on Member States, including undertaking road safety audits; and road safety assessments of new road schemes.
Common road safety target. Commission Communication of 20 July 2010 to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – "Towards a	This is not strictly legislation. There is a target to halve the number of road deaths in the EU by 2020.	

European road safety area: policy orientations on road safety 2011-2020" [COM(2010) 389 final – Not published in the Official Journal]		
Annex III to Directive 91/439/EEC and 2006/126/EEC	Article 95 (ex. Article 75)	This amends the rules in relation to driving with epilepsy, diabetes and defective vision.
Commission Directive 2000/56/EC	Article 95 (ex. Article 75)	This legislation sets out the content of theory and practical driving tests and how they must be conducted, including the ages for access to various categories of vehicles and the types of vehicle that are suitable to be presented for a practical driving test.
Directive 2003/59/EC (Driver CPC)	Article 91 (ex. Article 71)	Sets out the rules for professional drivers of buses and lorries for obtaining and holding a driver certificate of professional competence including the periodic training required to hold such a certificate.
2002/85/EC – amending Council Directive 92/6/EEC 5 November 2002 on the installation and use of speed limitation devices for certain categories of motor vehicles in the community.	Article 91 (ex. Article 71)	Installation and use of speed limitation devices for certain categories of motor vehicles in the community.
Directive 2009/40/EC (and related 2010/47 and 2010/48) of the EU Parliament and of the Council of 6 May 2009 on roadworthiness tests for motor vehicles and their trailers. Also Directives 2000/30/EC and 1999/37/EC	Article 91 (ex. Article 71)	To improve road safety throughout the EU by carrying out periodic roadworthiness tests.
Directive 2010/40/EU of the European Parliament and the Council of 7 July 2010 on the framework for the deployment of Intelligent Transport Systems (ITS) in the field of road transport and for interfaces with other modes of transport	Article 91 (ex. Article 71)	To co-ordinate and accelerate harmonised deployment of ITS across Europe.

COM(2012)199. Commission Communication. Not a Directive but provides guidance and refers to a couple of test cases in ECJ.	This is guidance rather than a directive. Based on principle of non-discrimination on the grounds of nationality (Article 18)	For light private vehicles, provides guidance on vignette (time-based) charges to ensure non-discrimination against nonresident drivers. Guidance refers to European Courts of Justice case law.

Actions 1.3 – 1.5: Stakeholder Consultation

A wide programme of consultation, information gathering and discussion has been undertaken in Burgos, Lancashire, Modena and Southend and the information obtained has been shared amongst all the partners.

Southend-on-Sea Consultations

We have consulted stakeholder groups of older people in Southend and invited them to discussions about issues of concern, with the purpose of including these in the SaMERU questionnaire. In this way, we believe the questions have covered all the relevant areas providing a comprehensive picture of opinions, views and ideas for the future. This has been invaluable in improving our understanding of problems facing elderly road users. Evidence obtained from these consultations has placed us in a good position to investigate possible solutions and how they may be prioritised.

1st Stakeholder Meeting, Southend 10th May 2011

At this meeting, a group of older residents of Southend was informed about the aims of SaMERU and how residents would be invited to offer their views on road safety issues of concern to them. The delegates formed into separate groups of 3-4 people and each group discussed road safety, the draft questionnaire that had been prepared by officers of the council and how they would have the opportunity to continue their participation in SaMERU.

The value of improving physical fitness in older people and the beneficial effect this could have on road safety was briefly outlined to the group. In order to generate a light-hearted community spirit, a Southend United FC fitness trainer took the group through gentle keep fit exercises with the aid of several footballs. This was well received and we hope it made a lasting impression on the participants of the value of keeping fit in their later years. The relationship between physical fitness and road safety in older people is discussed later in this report in the context of driver and pedestrian safety.

2nd Stakeholder Meeting, Southend 28th February 2012

This meeting took place at the half-way point in the project and served to update stakeholders on progress achieved in the local authorities of Burgos, Lancashire, Modena and Southend and with the research establishments of IFSTTAR and the Technical University of Dresden. It was an opportunity for the stakeholders to attend a workshop and discuss the initial responses to the questionnaire they had helped to develop. Another workshop discussed a recently produced road safety booklet that was designed specifically to help elderly road users.

3rd Stakeholder Meeting, Southend 26th November 2012

The 3rd stakeholder meeting provided a further update on progress and discussed the difficulties faced by older people negotiating complex intersections, right-turns, pedestrianised areas and traffic signs. Driving licence renewal procedures were discussed. A workshop was arranged for local residents to suggest possible safety improvements to benefit older people at 3 sites in Southend that had a poor safety record. Delegates discussed the various modes of transport used by elderly people in Southend and Modena – the main differences being the low percentage of cycle trips in Southend, 2.7% compared with 24.7% in Modena, whereas bus use in Southend was 23.5% and 11.9% in Modena.

The key observations from the workshop are as follows:

- The wide range of views that were expressed according to individual circumstances and needs;
- Agreement regarding the need for wider footways to accommodate all likely pavement users;
- The need to control the use of footways;
- Informal highway design causes confusion to both drivers and pedestrians alike;
- PUFFIN crossings require improvements;
- All bus stops need shelters;
- Turning right at junctions requires particular care; and
- Many cars are driven too fast.

The key suggested improvements were as follows:

- As with issues, the suggested improvements varied with each respondent;
- Apart from Hamlet Court Road, speed reduction was suggested;
- Pedestrian crossing improvements were suggested, particularly including longer crossing time;
- Informal road layouts cause confusion and uncertainty; and
- Obstructions on the footway including parked vehicles and bicycles to be controlled more

4th Stakeholder Meeting, Southend 14th February 2013

Further questionnaire results were available and these were discussed by stakeholders. Bus travel for older people was considered important because it is relied upon to maintain mobility and in some cases is the only viable means of transport.

The following key recommendations emerged from the workshop:

- Obstacles should be minimised on what should be a good quality footway;
- More good quality bus shelters with good timetable information should be provided that provide travellers with protection from all types of weather;
- An accessible bus needs to be designed to enable easy alighting with more hand grips for moving about the bus and non-slip floor surfaces;
- Ways to provide additional bus services during evenings and weekends, particularly where services are lacking, should continue to be investigated and supported;

- Designers should take more account of elderly needs on footways, at bus stops and on buses;
- More regular meetings should be held with bus operators to ensure service issues are being resolved for elderly bus users;
- Strategic Transport Planning should continue to liaise with the Older Peoples Assembly to advise them of issues of interest including advances with Automatic Vehicle Location (AVL) software for audible and visual travel information and new ticketing options;
- Passengers should receive training based upon the 'Be safe by bus, Practical Training for Older Passengers' produced by Aeneas 2010 with the assistance of bus operators; and
- Bus drivers should be encouraged to be more respectful of the needs of their elderly passengers and be given training specifically on the needs of their elderly passengers.

5th Stakeholder Meeting, Southend 16th July 2013

This meeting was an opportunity for stakeholders to receive feedback from the SaMERU conference held in March 2013. The principal recommendations were published in the conference brochure and these were discussed along with further good practice recommendations and topics for further research that were recent additions. Some of those present had also attended the conference and said that they thought it was of great benefit. This was also confirmed by the comments in the conference feedback forms. Four workshops running concurrently dealt with 1) restricted speed areas, 2) road maintenance, junction and crossing improvements, 3) vehicle design, bus services 4) education, training, publicity and age-based driving assessments.

Lancashire Consultations

Older Road Users' Seminar 5th December 2012, Woodlands Conference Centre, Chorley

This seminar was attended by older road user interest groups, local authorities, the Highways Agency, Fire, Police, Health Services, the University of Central Lancashire and Atkins. The aim of the seminar was to bring together all the public services in Lancashire that have a role to play in reducing road collisions involving older people and agree a course of actions for future partnership working.

The following actions were agreed: (*indicates already under development by Lancashire CC)

Communication: Raising Awareness of Existing Services

- *Keep Elected Members better informed of new and ongoing travel services.
- Distribute a road safety guide to improve awareness of politicians and senior officers responsible for public services of ongoing and future initiatives to reduce elderly road user casualties.
- Gather updates from partners and upload information on *new website and issue a quarterly e-newsletter to publicise new and improved services.

- Arrange poster campaigns and leaflet drops to households and local media to promote travel and transport services relevant to older people and the new web resource.

Encourage Active and Sustainable Travel

- Offer personalised travel plans to older residents.
- Develop a course on the use of alternative transport to the car for the elderly.
- Improve conditions for walking, including improved footways, resting points (benches etc.).
- Dealing with parking and cycling on footways.
- Improved ice and snow clearance on footways.
- Extend the Healthy Streets Project to further encourage active short journeys
- Equip doctors surgeries with a package of travel support services targeted at older patients.
- Offer peer-based travel training for public transport.
- Promote taxi share, particularly in rural areas.
- Target older people for cycle rides
- Distribute and promote the use of communicator cards for use on public transport e.g. 'please wait until I sit down'
- Target grandparents via schools, children's centres and nurseries to promote active travel opportunities.
- Through the Lancashire County Council (LCC) Safer Travel Team, reduce nuisance behaviour on buses.
- Widen promotion of trampers and tramper training. (Trampers are all-terrain mobility scooters that allow people with mobility problems access to areas of natural beauty).

Drivers and Driver Training

- Provide a 'Frequently Asked Questions' sheet promoting driver training.
- Introduce older drivers and concerned friends and relatives campaigns.
- Promote driver training courses through: health and vision checks, forums, Elected Members, concerned friends and relatives, car dealerships.
- At age 70 driving licence renewal stage, offer refresher training.
- Target grandparents for driver training via schools, children's centres and nurseries.
- Recruit community and religious leaders to attend course to enable direct respected feedback to local groups.
- Offer support and advice to concerned friends and relatives.
- Provide older drivers, doctors, friends and relatives with details of travel support services for those no longer able to drive.
- Establish feedback process for police referrals to 'Drive Safely for Longer' course.
- Negotiate car insurance reduction for course participants.
- Widen the use of employee questionnaire designed by Little Green Bus to identify and address concerns about travel issues of concern to older passengers.
- Identify 'Champions' among participants on driver training courses to be Ambassadors.
- Recruit older newspaper reporters to participate on driving course and feedback their views through the media.
- Produce a video to show what the driver training course involves.

- Liaise with TV channels to produce storylines (soaps) on older driver safety e.g. Coronation Street.

Reduce Pedestrian Casualties

- Support compliance with 20mph (30kph) areas.
- Increase community road watch and schools watch.
- Deal with illegal and inconsiderate parking, obstructing pedestrian sightlines and blocking footways thereby forcing pedestrians to walk in the carriageway.
- Improve pedestrian visibility by distributing reflective accessories.
- Provide anti-slip shoe covers for use in winter conditions.
- Produce a users' guide for all types of pedestrian crossings.
- Improve mobility scooter safety on footways through compulsory training prior to use.
- Educate all road users and social groups to be more patient and understanding of older people.

Modena Consultations

Modena Public Meeting held on 30th March 2012, Europe Direct Centre, Piazza Grande, Modena

This event was part of a series of road safety initiatives that reached out to the elderly community of Modena. The aim was to present the SaMERU initiatives for improving the safety of elderly road users and explain the particular road safety interventions that were taking place in Modena.

The meeting was attended by members of the Local Elderly Committees, Pensioner Unions, Road Victims Family Association, Italian Federation of Urban Cyclists and Bicycle Tourism (FIAB), Officers and Elected Members of the City of Modena, representatives of the City Police and The Office of Traffic Police and the Local Health Authority. Representatives of all the SaMERU partners were present.

Presentations were given by Franco Chiari, the Head of Modena's Municipal Police; Paul Mathieson, the SaMERU Co-ordinator, Vittorio Martinelli, City of Modena Research Office, Carlo Goldoni, Local Health Authority of Modena Epidemiology Service; Stefano Savoia, City of Modena Territorial Planning and Private Building Department and Jackie Brindle, Lancashire Councty Council. The presentations contained information collected from surveys, details of which may be found in Work Package 6 - Marketing, Training & Awareness.

An information point was set up for the meeting and manned by a volunteer from the Civil Service in collaboration with the City Police and Safety Police Office. Members of the public were invited to visit the information point to ask questions and offer their views on road safety within the city. SaMERU promotional material was given out and people were encouraged to register for the forthcoming road safety course for the elderly at Modena's Autodrome.

During the public meeting, the City Councillor for Quality and Safety declared his intention to renew the Agreement on Road Safety. The previous Agreement covered the period 2009

to 2011 and was signed by local representatives of the elderly, Friends of the Bicycle and Relatives of Victims of the Road.
The feedback from the meeting was very positive and awareness of the road safety problems facing the elderly was widely reported by local TV and newspapers.

Burgos Consultations

Burgos - Stakeholder Contact on Site August 2011

During August 2011, a survey was undertaken in Burgos to discover elderly cyclists' views on cycling in the City. The surveys were conducted on-street at six different locations by stopping and interviewing older people riding a bike. Two hundred people over the age of 55 agreed to be interviewed. The duration of the interviews was between 3 and 5 minutes.

The aims of the survey were to:

- Identify patterns of cycling.
- Determine the perception of safety on the road and on cycleways.
- Obtain the views of key groups of elderly cyclists on safety according to age and gender.
- Discover how barriers may be overcome in order to encourage more trips to be undertaken by bike by people over 65 years of age.

The survey showed that many people do not feel safe cycling because of the conflict with vehicles and pedestrians. Older cyclists still did not feel completely safe when using dedicated cycleways shared with pedestrians. Many of the respondents complained about the lack of respect and attention shown to them by drivers and pedestrians.

Further information about cycling in Burgos may be found in Work Package 5 - Sustainable Transport Modes and Safety.

Questionnaire

The questionnaire seeking the views of people older than 65 years on road safety issues was developed in Southend, with contributions from older people's groups. A detailed analysis of the responses to the questionnaire, including confidence levels and confidence intervals, has been carried out and may be found by visiting www.sameru.eu

The questionnaire was sent out to various senior citizens' clubs who distributed it at their regular meetings. In Southend, 329 completed questionnaires were returned. The following organisations helped with the distribution:

- Older Peoples Assembly
- Club 60
- Age UK (previously Age Concern & Help the Aged)
- Southend Carers Forum

The questionnaire was translated into Spanish and Italian and similar surveys carried out in Burgos and Modena.

In Burgos, 93 people over 65 years of age responded to the Questionnaire and in Modena the figure was 460. In Modena, those interviewed were representative of the older population in terms of age, gender and residential area.

In Burgos, the following groups were consulted and assisted with distribution of the questionnaire:

- Municipality Centres for Leisure (4)
- Private Leisure Centres - Social Banks "Cajas" (2)
- Local Association for Elderly Women (No equivalent for elderly men)
- Neighbourhood Associations

The key findings of the questionnaire are shown below.

Pedestrian Crossings
Are audible bleepers helpful when crossing the road?
Burgos – 90% said yes; Modena – 84% said yes; Southend – 87% said yes

Are longer crossing times needed at PUFFIN and traffic signal crossings?
62% of respondents from Burgos and Southend agreed. In Modena, there are no PUFFIN crossings.

Tactile Paving
Although tactile paving is believed to benefit the visually impaired, it is often considered uncomfortable, may cause a trip hazard and is disliked by some people.
Some comments by respondents:

- Burgos – "I don't like them but I know they are useful"
- Burgos – "They are not safe when it snows or rains"
- Southend – "I don't like them. Tactile paving is a hindrance but good for blind people"
- Southend – "Good for the visually impaired, poor for walkers with foot or leg problems"
- Southend – "Suitable for the visually impaired but can hurt feet"
- In Modena, there is no tactile paving.

A considerable amount of research has been carried out into the use and public perception of tactile paving by the Inclusive Design for Getting Outdoors (I'DGO) project. Key messages from I'DGO were; "Inconsistency between types of road crossing and tactile paving, for example, can make older people uncertain about features that are designed to be enabling. Providers' adherence to guidelines may improve this outcome, as might public awareness-raising as to what is supposed to be used, where and for what purpose." Readers are recommended to visit: http://www.idgo.ac.uk/design_guidance/pdf/DSOPM-Tactile%20Paving-120904.pdf for further information.

Footway Maintenance
A high proportion of residents in Modena and Southend consider footways are not adequately maintained:
Burgos – 40%; Modena – 79%; Southend – 69%

Pedestrian/Cyclist Conflict

I feel unsafe about cyclists using the footways:
Burgos – 85%; Southend – 81%
Southend – "Enforce the law regarding cyclists on the footway"
Burgos and Southend – "Cyclists should have bells to make you aware of them"
Burgos – "More bike lanes"

Driving
Approximately half the over 65's in Burgos, Modena and Southend said they drive on a regular basis.
In Modena, 74% regularly drive on Motorways and 71% regularly drive at night
In Burgos, the figures are 20% and 23% and in Southend, it is 26% and 4% respectively.

Health and Driving
A majority of respondents in Southend consider it would be reasonable for drivers over the age of 65 to be required to take annual health and eye tests as a condition of driving licence retention. In Italy and Spain, all licence holders are required to take tests, which are mandatory for all ages.

Upon asking how residents would feel if they were no longer able to drive for medical reasons, older people in Burgos, Modena and Southend said they would feel sad, restricted and frustrated.

Bus Travel
In Burgos, 79% of older people use the bus. In Modena and Southend, the figures are 45% and 71% respectively.
About 25% of residents in Burgos, Modena and Southend do not think the bus service is adequate for older people. The following is a representative selection of comments:
Burgos – "I don't like to be standing up, I find it dangerous"
Modena – "I have to hold on tightly because bus drivers go fast and brake suddenly"
Burgos – "I sometimes have to wait a long time"
Southend – "There is a lack of room in some cases. Also, drivers go too fast and brake too sharply"
Modena – "I have concern over getting on and off the bus because the entrance is very high"
Southend – "Driver sets off too early, before everybody is seated. Some buses do not have low-level entry"

Direct Marketing
We also engaged in direct marketing through other street events such as the Southend Carer's Week and a Collection Café in addition to residents who expressed an interest in being consulted about various projects in Southend.

In Lancashire, further stakeholder consultation took place. On street surveys were conducted at 6 locations to determine the safety concerns and risk perceptions of older road users. SaMERU community road shows also took place at 4 locations to offer travel and road safety advice, recruit participants to SaMERU training courses, and to distribute the travel diary.

In Modena, road safety information points were established in city squares. Policemen and the representatives of old people were present to distribute questionnaires and give out information to increase awareness of road safety issues. The following groups were consulted and assisted with distribution of the questionnaire:

- The City's 'Not Alone' help desk
- Association of Retired Police Officers
- The CGIL, CISL, UIL Trade Unions
- Old People's Committee
- The Italian Association of Road Victims and their Relatives

Travel Diary

The same methodology used to produce the questionnaire has been used to produce a travel diary, which has also been translated into Spanish and Italian. The purpose of the travel diary was to discover travel patterns of the elderly to further add to our knowledge of mobility. In particular, we have obtained information about travel times, trip durations, destinations, modes of travel and reasons for travel.

In Southend, 63 completed travel diaries were returned of which 53 people were aged 65 or over. Care must be taken with the interpretation of the data because the sample size is relatively small and therefore the picture of travel patterns for people in Southend should not be seen as completely accurate. It should be noted that completing the travel diary requires a significant effort and diligence on the part of respondents and it is therefore time consuming and expensive to carry out this type of survey. However, it serves as a snapshot of the travel patterns of those people who were kind enough to supply us with their personal details over one week in 2012.

In Southend, the majority of respondents recorded that shopping was their main reason for travel (32%) followed by social activities (25%) and dog walking/pet care (13%).

A comparison of trips between people over 65 years in Southend and Modena is shown below, from which it may be seen that trips by cycle in Southend are very low in comparison with Modena. This is an area being investigated for further action in Southend to encourage more cycling activity amongst older people. The numbers of trips by car are almost the same in the two towns but bus trips are nearly twice as numerous in Southend. In Modena, the benefits of cycling were promoted and cyclists were reminded of the need to observe the Highway Code.

It would be interesting to compare the percentage total casualties from each mode for each city, alongside the trip mode data. Also, given the high percentage of older cyclists in Modena compared to Southend and the fact that people get out more in Modena – how do life expectancy and incidence of diabetes etc compare?

A detailed analysis of the responses to the travel diary survey, including Confidence Levels and Confidence Intervals, has been carried out and may be found by visiting www.sameru.eu

The link Between Mobility and Social Care

Our discussions with groups of elderly road users coupled with our work with IFSTTAR and the Technical University of Dresden has reinforced our understanding that there is a link between mobility and health.

Our work with IFSTTAR has provided evidence that a modal shift away from the car to more sustainable forms of transport could help older people become safer, more independent, less isolated and healthier, thereby reducing demands on health services. However, more work is needed in this area particularly with regard to the practical issues of accessibility to public transport services, cycling, walking, the highway environment and the effect on the levels of fitness and well-being of older people.

SusMAP Sustainable Mobility for an Ageing Population
Following our work with IFSTTAR it was decided to test the demand to undertake work on the link between mobility and health. In 2012, Southend, the SaMERU Co-ordinator, advertised the concept of SusMAP to public and private organisations in Europe through the Polis network and obtained a positive response from more than 50 organisations. There was general agreement amongst the respondents that the link between mobility and health could have large benefits for older people and reduce the demand on health services. We believe that a future project like SusMAP has the potential for a study at a European level and this was discussed at the SaMERU conference.

Actions 1.6-1.8: Medical Factors

Sensorial Changes (vision, hearing, touch)

Introduction
The links between sensorial and perceptual skills on the one hand and road user behaviour on the other, are particularly relevant with regard to older road users because these skills tend to decline with ageing. We have examined the consequences on road user behaviour by considering two major outcomes: safety (i.e., collision involvement) and driving performance (e.g., adopted speed, latency, scanning behaviour, as evaluated on driving simulators or on-road driving tests). A large part of the data presented here is about vision, because hearing and the role of auditory information in road user behaviour has been rarely investigated (Sivak, 1996).

Review of the Main Sensorial Changes that Influence Elderly Road Users' Mobility
Ageing affects several visual functions: visual acuity, contrast sensitivity, dark adaptation (adaptation to low light levels) and glare sensitivity, visual field, visual motion sensitivity, and useful field of view (Anstey, Wood, Lord, & Walker, 2005).

Regarding elderly drivers, the link between poor visual acuity and increased risk of collisions is not consistent (see Owsley & McGwin, 2010). Investigations of driving performance suggest that a low visual acuity impedes road sign recognition and road hazard avoidance but not the ability to navigate the vehicle along a route or to judge clearances between obstacles (Higgins & Wood, 2005; Higgins, Wood, & Tait, 1998). The association between contrast sensitivity declines and increased collision involvement also lacks consistency (Ball, Owsley, Sloane, Roenker, & Bruni, 1993; Owsley, Ball et al., 1998; Owsley, Stalvey, Wells, Sloane, & McGwin, 2001), whereas driving performance is impeded (Wood, Troutbeck, Thibos, Elliott, & Bradley, 1995).

Despite the assumption of a negative effect, previous studies failed to show a significant association between glare sensitivity and collision risk (Ball et al., 1993; Owsley et al., 2001). Visual field impairments are not associated with an increased risk of collision or violation rates in all studies (Decina & Staplin, 1993; McGwin et al., 2005; Owsley, Ball, et al., 1998; Rubin et al., 2007). Motion ability declines are associated with increased risk of collisions (Staplin & Lyles, 1992), poorer on-road test scores (De Raedt & Ponjaert-Kristoffersen, 2000) and more self-reported driving difficulties (Raghuram & Lakshminarayanan, 2006). Finally, several studies demonstrated that poor scores in the Useful Field Of View test (UFOV, Visual Awareness, Inc., Chicago, IL) are associated with increased risk of collisions among older drivers (Ball et al., 1993; Ball & Owsley, 1991).

The weak link between visual functions and collision involvement as well as the lack of consistency between studies may be partly due to compensatory behaviours in older drivers. In fact, driving modifications (e.g., reduction in mileage, cessation of night driving and cessation of driving in unfamiliar areas) are more frequent in elderly drivers with poor visual functions than in elderly drivers with better visual functions (Freeman, Munoz, Turano, & West, 2006).

In the case of pedestrians, visual acuity loss may cause difficulties in perceiving vehicles in complex road environments (Carthy, Packham, Salter, & Silcock, 1995 in Oxley, Fildes, Ihsen, Day, & Charlton, 1995) and increase the risk of falls (see Harwood, 2001; Ivers, Cummings, Mitchell, & Attebo, 1998).

Contrast sensitivity impairments are associated with a higher risk of falls (Ivers et al., 1998; Lord, Clark, & Webster, 1991). These impairments are also suspected to impede the discrimination of fixed objects such as kerbs and pavement cracks and of moving objects such as oncoming vehicles (Oxley, Fildes, Ihsen, Day, & Charlton, 1995). Poor dark adaptation was found to be more frequent among elderly "fallers" than "non fallers" (McMurdo & Gaskell, 1991) and binocular visual field loss was found to increase the risk of recurrent falls (Coleman et al., 2007; Freeman, Munoz, Rubin, & West, 2007). In street-crossing situations, the decline of visual motion sensitivity due to ageing has been shown to contribute to the increase of unsafe crossing decisions in older pedestrians (Cavallo, Dommes, Boustelitane, Mestre, & Vienne, 2010; Lobjois & Cavallo, 2007). UFOV scores are predictors of unsafe street-crossing choices (Dommes & Cavallo, 2011, Dommes, Cavallo, & Oxley, 2013) and also of mobility difficulties and falls (see e.g., Owsley & McGwin, 2004).

Cataracts, macular degeneration and glaucoma are pathological visual changes frequently observed during ageing. These three pathologies adversely affect driving performance (Kline & Li, 2005; Szlyk et al., 1995; McGwin et al., 2005) and increase the risk of falls (Haymes, Leblanc, Nicolela, Chiasson, & Chauhan, 2007; McCarty, Fu, & Taylor, 2002; Szabo, Janssen, Khan, Potter, & Lord, 2008). However, compensatory behaviour is frequent and driving cessation is precocious in drivers with these pathologies and could thus reduce the risk of accidents (Lyman, McGwin, & Sims, 2001; Ramulu, West, Munoz, Jampel, & Friedman, 2009; Rosenblum & Corn, 2002).

The impact of hearing on road safety has been studied much less than vision, despite the fact that hearing impairments are frequent in the elderly population. Accident studies do not provide clear evidence for an increased risk of car collisions due to hearing loss (Anstey et al., 2005). However, hearing loss may impede driving performance in presence of distractors or when auditory information is important (Hickson, Wood, Chaparro, Lacherez, & Marszalek, 2010; Meston, Jennings, & Cheesman, 2011).

Hearing helps to improve awareness of the presence of vehicles and to spatially locate them. Therefore, elderly pedestrians with hearing impairments are likely to have difficulties detecting vehicles approaching from behind or turning (Dunbar, Holland, & Warwick, 2004). Elderly adults who felt that their hearing had deteriorated over previous years are reported to avoid walking along roads without a footway but there are no reports of other changes in their behaviour as a pedestrian (Holland & Rabbitt, 1992). Further studies are needed to investigate the impact of hearing loss on pedestrian safety.

Discussion

The lack of consistent results can be in part explained by the necessity to use visual measures that accurately account for the visual and cognitive complexity of driving and pedestrian tasks. It has been shown that combined vision screening criteria (acuity, visual field and contrast sensitivity) are predictive of collision rates, whereas visual acuity by itself is not (Decina & Staplin, 1993). Declines in processing speed and visual attention by UFOV tests have been regularly associated with a higher risk of collision in elderly drivers (see Anstey et al., 2005; Rubin et al., 2007) and have more recently been related to the safety of street-crossing decisions in elderly pedestrians (Dommes & Cavallo, 2011). These observations suggest that the assessment of complex visual measures such as UFOV test is better for screening older road users than using visual sensory tests (e.g., visual acuity).

Periodic screening of drivers should only be imposed if its efficacy is well established (Eyesight Working Group, 2005). The efficacy of screening depends on the prevalence of impairments screened, the sensitivity of tests used and the benefit/cost of the screening procedure (Eyesight Working Group, 2005). Several European states require eyesight tests as a condition of driving-licence renewal but no clear beneficial effects of screening of visual functions has been reported (see Eyesight Working Group, 2005; OECD, 2001). This lack of efficacy could be explained by the fact that elderly drivers with vision loss often modify their driving behaviours or choose to stop driving. Other visual functions such as measured by the UFOV show a stronger link with road safety, but no standards regarding cut-off are available (Eyesight Working Group, 2005). Regarding hearing loss, the usefulness of systematic screening is not supported because of the lack of clear evidence about a larger risk of road accidents.

The medical prevention and treatment of sensorial impairments is a major factor in the preservation of safety and mobility during ageing. Cataract surgery has positive effects on road safety in reducing the risk of driving accidents (for a review, Subzwari et al., 2008), but reductions in the risk of falls are less consistent (for a review, Desapriya, Subzwari, Scime-Beltrano, Samayawardhena, & Pike, 2010). The adaptation of road infrastructure is important too, for example providing adequate levels of lighting may reduce the risk of falls (McMurdo & Gaskell, 1991).

In conclusion, some links between vision impairments and safety have been observed in elderly road users. The stronger links between vision and driving safety pertain to visual motion sensitivity and UFOV. Studies about elderly pedestrian safety suggest an involvement of the UFOV too. Pathological visual changes (cataract, macular degeneration, and glaucoma) increase with ageing and have a negative effect on driving performance and the risk of falls. However, the presence of compensatory mechanisms in elderly adults is increased by the presence of visual impairments. These compensatory mechanisms could explain why the link between visual impairments and the risk of driving collision is weaker than the link with driving performance. Future studies should develop more complex visual measures that better predict driver (and more generally road user) safety. Further studies are also necessary to investigate the impact of sensorial loss on the safety of elderly cyclists and public transport users.

Physical Functioning and Medical Conditions

Introduction

Physical and medical factors influence road user behaviour in many ways. For instance, community-based interviews indicate that medical conditions or health issues are the most common reasons cited by older adults for driving cessation (Carr, Flood, Steger-May, Schechtman, & Binder, 2006).

Elderly adults are concerned by several physical changes or medical conditions, such as cardiovascular diseases, diabetes, strokes, sleep disorders, osteoporosis or arthritis. These physical and medical conditions are likely to adversely affect road safety and mobility.

Older adults with physical disabilities have a greater risk of motor vehicle collisions (Sims, McGwin, Allman, Ball, & Owsley, 2000). They are also more vulnerable to injury (Kent, Funk, & Crandall, 2003 in Carr et al., 2006) in so far as they are more seriously injured by a given physical impact and therefore collisions have more serious consequences for this group. Research suggests that around one-half of the additional fatality risk of drivers aged 75 years or more might be due to frailty rather than unsafe driving practices (Langford, 2006). Only a few studies addressed the impact of physical and medical conditions on cycling and using public transport.

Links Between Physical Functioning, Medical Conditions, and Road Safety

The reviewed literature highlights the impact of physical and medical conditions on road user mobility and safety. The significant links between physical functioning and elderly road users' safety are summarised in Figure 1.

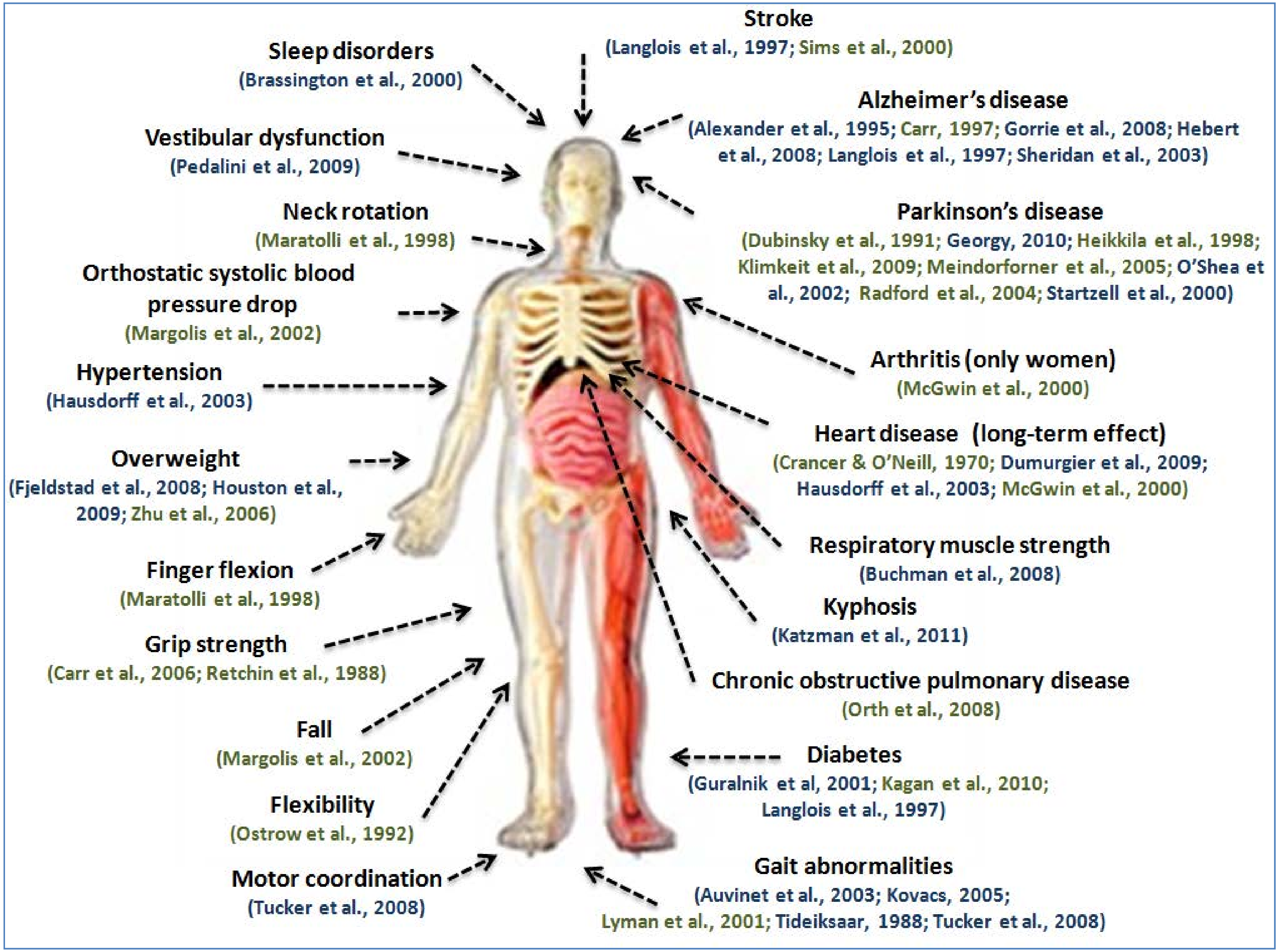
Links between physical functioning and elderly road users' behaviour can be direct or indirect according to the type of impairment.

Direct consequences can be observed when the impairment impedes the road user behaviour. For example, arthritis, osteoporosis and kyphosis impact on pedestrian behaviour in such a way that walking speed is reduced, together with the ability to negotiate uneven footways, steps, or kerbs, and the ability to move the head and the neck when looking out for approaching traffic. Balance deficit is an important risk factor for elderly pedestrians and therefore has direct consequences for their safety. Older drivers with restricted head movements have difficulty observing traffic to the side and rear of their vehicles, which has safety implications.

Other physical and health conditions may have more insidious and indirect consequences for elderly road users' safety and mobility. For instance, cardiovascular diseases and strokes seem to increase the risk of a collision but the effect is indirect because of the combined alteration of cognitive and sensori-motor skills. Neurological disorders also impede elderly road user actions because additional cognitive conditions further contribute to the collision risk. Alzheimer's and Parkinson's diseases are associated with physical declines, but these conditions mostly cause combined cognitive declines that impede decision-making and the way environmental information is processed even before any physical actions are taken.

At the present time, very little is known about the respective and combined impacts that the various physical declines and diseases have on road safety and mobility. This is due to the fact that, in most of the studies investigated, these factors: according to the review of Anstey et al. (2005), five studies (Martolli et al., 1998; Margolis et al., 2002; McGwin et al., 2000; Sims, Owsley, Allman, Ball, & Smoot, 1998; Sims et al., 2000) addressed the respective and combined effects of several age-related physical declines on older drivers' safety, but their conclusions varied. Methodological difficulties (i.e., for establishing accurate controls for exposure, potentially confounding or moderating factors) may explain these discrepancies (Elvik, 2011).

Figure 2 - Summary of the Significant Links Between Physical Functioning and Elderly Road Users' Safety Presented Throughout the Literature (in green for driver and blue for pedestrian)



Discussion

Physical activity and exercise seem to be a promising way of staying mobile. Regular physical exercise enhances fitness as well as overall health and wellbeing. Exercise strengthens the cardiovascular system, maintains muscle mass and muscle strength and therefore allows elderly people to better perform daily life activities. In addition, physical activity seems to help prevent weight gain and obesity, as well as the appearance of chronic diseases such as diabetes, hypertension, coronary heart disease, or osteoporosis (Schuit, 2006).

As proposed by Schuit (2006), the emphasis should be given to physical daily life activities such as walking, cycling, or gardening. Increasing the proportion of daily walking and cycling as a means of transportation is also a good way to improve physical functioning. Moreover, several training programmes involving physical exercises have shown positive effects on driving and walking abilities (see the section about the capacity of learning and adaptation).

Specific physical exercise focusing on cardio-respiratory fitness has also been shown to protect against cognitive dysfunction in older people (see e.g., Clarkson-Smith & Harley, 1989; Kramer et al. 1999; Yaffe, Satariano, & Tager, 2003). This kind of training programme therefore seems particularly promising and should be widely promoted for older drivers as well as for older cyclists and older pedestrians. It is likely to improve the safety of elderly people on the road, by enhancing physical as well as cognitive abilities and is relevant for safety and mobility of all older road users.

Influence of Alcohol and Medication

Introduction

Medication and alcohol are substances that can cause psychoactive effects, which influence the safety of elderly road users. This action was aimed at identifying the possible impacts of psychoactive substance use, misuse and abuse on elderly road user safety and mobility.

The problem of substance intake and abuse among older adults has been ignored for a long time. The expression “invisible addicts” is used to point out the lack of interest in this question (Royal College of Psychiatrists of London; 2011) but the addiction of older adults constitutes a growing problem. Data suggest that the number of people aged over 65 with a substance use problem or needing treatment will more than double between 2001 and 2020 in Europe. This is linked to the size of the ageing baby-boom cohort and the higher rate of substance use among this group (European Monitoring Centre for Drugs and Drug Addiction, 2008). This increasing number makes more pressing the necessity to better understand the impacts of psychoactive substance use and abuse among older adults and, specifically for our purpose, their effects on the safety and mobility of elderly road users.

The consumption of medication is very high in the elderly population. For example, in the United States community-dwellings for older persons, more than 90% use at least one medication per week and more than 40% use five or more different medications per week (Gurwitz, 2004 in NHTSA, 2006). The most prescribed medication categories were cardiovascular, opioid and non-opioid analgesics. This combination is alarming because it increases the risk of negative interactions between medications. These trends are comparable in most of the countries of EU and the prescription of potentially inappropriate medication in elderly population is also relatively high in Europe (around 20% of the patients, see Fialova et al., 2005).

Alcohol consumption in the elderly population is often considered to be an infrequent problem. However, in Europe, 27% of people aged 55 and over actually admit to drinking alcohol on a daily basis (European Monitoring Centre for Drugs and Drug Addiction, 2008). This prevalence is higher for men than women (Andersson & Scafato, 2010).

The simultaneous intake of medication and alcohol is relatively frequent. A Finnish study revealed that most alcohol drinkers aged 75 years and over used medication on a regular basis (87%) or occasionally to deal with specific conditions (88%), with among them, some medications known to have potential interactions with alcohol (Aira, Hartikainen, & Sulkava, 2005).

Links between Medication, Alcohol, and Road Safety

An overview of the literature shows the lack of studies specifically investigating elderly consumers. Available information mostly concerns implications on driving and suggests that several medications and alcohol increase the risk of vehicle collisions in this age group (Dassanayake et al., 2011; Higgins et al., 1996; Meuleners et al., 2011). Among the various classes of psychoactive substances that affect the central nervous system in a way that it could impair driving are alcohol, anticholinergics, anticonvulsants, antidepressants, antiemetics, antihistamines, antihypertensives, antiparkinsonians, antipsychotics, benzodiazepenes, sedatives, anxiolytics, muscle relaxants, narcotic analgesics, nonsteroidal anti-inflammatory drugs, and stimulants.

Accident studies and behavioural investigations into the consequences of psychoactive substance use and abuse on the safety of older road users other than drivers (i.e. pedestrians, cyclists or users of public transport) are very scarce. However, psychological studies suggest that cognitive, sensorial, and physical functioning could be impaired by medication intake or alcohol consumption. The risk of mobility disability (i.e., falls, slowing of walking speed, etc.) is evident even with the use of low doses of medication, and increases with the dose and the number of medications taken (Riefkohl et al., 2003). Cognition, balance and motor dexterity are also impaired by even low alcohol consumption (Liguori et al., 1999; Noël et al., 2010).

Medication and alcohol often interact negatively and innocuous medication could become dangerous in association with alcohol, which could also increase the side effects of medication. For example, alcohol enhances the sedative effects of antidepressants, antihistamines, barbiturates, muscle relaxants, benzodiazepines, and opioids, increasing the risk of falls or automobile accidents (European Monitoring Centre for Drugs and Drug Addiction, 2008; Pringle, Ahern, Heller, Gold, & Brown, 2005).

Discussion

The media has a large contribution to make in the dissemination of prevention messages. The focus has been mostly on drivers and the lack of extensive campaigns about the risk associated with cycling, walking on or across a roadway when intoxicated is regrettable. Furthermore, active discouragement of drinking and driving must avoid the encouragement of walking as a safe alternative (Holubowycz, 1995). Another need for future campaigns is to increase the focus on elderly road users and the negative impact of medication or alcohol intake.

Medical practitioners also have a large responsibility to issue warnings about the possible dangerous side effects of medication and alcohol consumption on road safety. The solution could be to establish a list of potentially inappropriate medications that could impair older adults' safety on the road (Fialova et al., 2005). The prescription of non-essential medication should be avoided and the number of prescriptions limited to those that are essential for the treatment of medical conditions. Any interaction between alcohol and medication should also be pointed out to the patient by medical practitioners.

Warning patients of the risk to road safety of some medications is of crucial importance and should be the responsibility of local and national authorities. For example, in 2003, the European Medicine Agency requested a standardised classification of medicines according to four levels of driving impairment risk, from 0 (no or negligible risk) to level 3 (major risk). The objective was to give clear information to health professionals and patients on the effects of medicines on driving abilities (Orriols et al., 2010). In France, a graded pictogram (level 1, level 2, and level 3) is printed on the outer packaging of medicines with possible side effects on driving (see Figure). Despite the presence of these pictograms, 3% of road traffic collisions in France between July 2005 and May 2008 were attributable to medications of levels 2 or 3. Follow-up studies are necessary to evaluate the long-term effectiveness of these pictograms on the prevention of road traffic collisions. In addition, it is necessary to emphasise that dangerous side effects are not limited to driving but include other forms of transport such as walking and cycling.

Figure 3 - French medication labelling system (Orriols et al., 2010)

Blood Alcohol Content (BAC) is commonly used as a measure of alcohol intoxication for legal purposes. Lowering the BAC limit from 0.08% to 0.05% seems to be particularly effective in reducing road collisions (Chamberlain et al., 2002). Another means to prevent alcohol consequences on road safety is to use stricter BAC limitations for certain categories of drivers. The European Commission already recommends a BAC of 0.02% for young drivers, inexperienced drivers and motorcyclists. As elderly adults are more sensitive than other adults to the psychoactive effects of alcohol, it would be logical to consider including them in these stricter limitations. Indeed, and as highlighted by Porter (2011), "lower BAC levels for older drivers may be exacerbated by potential interactions with many age-related conditions, including chronic illness, the simultaneous intake of several medicines or an underlying impairment".

This action highlights the need for studies to specifically investigate the consequences of psychoactive substance use and abuse on the safety of older road users, including drivers, pedestrians, cyclists and users of public transport. This knowledge would allow adequate preventative measures to be put in place.

Medical practitioners should be required to advise patients of the road safety risks of taking certain types of medication and this should be reinforced by further advice through local and national campaigns. Consideration should also be given to reducing the BAC limits for older drivers.

Actions 1.9-1.11: Psychological Factors

Cognitive Changes

Introduction

Cognition refers to all forms of knowing and awareness, such as perceiving, remembering, reasoning, judging, imaging, and problem solving. These processes are analysed from different perspectives within different contexts, notably in the field of cognitive psychology but also in several research fields such as traffic and transportation psychology.

Driving is a cognitively demanding task that requires memory, attention and visuospatial skills, processing speed, executive functions, navigation, and decision making. Although less frequently investigated, other modes of transport such as walking, cycling or taking public transport are also cognitively demanding. For example, pedestrian mobility demands attention, spatial navigation, road crossing decisions, etc.

Cognitive functions tend to decline during ageing but with large variations between people. In consequence, the cognitive abilities are more important than the chronological age for predicting the security of driving performance among older drivers (Adrian, Postal, Moessinger, Rascle, & Charles, 2011; Shanmugaratnam, Kass, & Arruda, 2010).

Links Between Cognitive Changes and Road Safety: Normal ageing

Several cognitive functions are modified during ageing and may be associated with an increase in road collision risk (see Table 1 for a summary).

Memory refers to the ability to store, retain, and recall information and experiences. Several memory declines are observed during ageing and may be linked to a decrease of driving safety in elderly adults. Declines such as working memory, episodic memory, and semantic memory have been shown to be associated with higher accident risk (Foley et al., 1995; McKnight & McKnight, 1999).

Attention is defined as a state of awareness in which the senses are focused selectively on aspects of the environment and the central nervous system is in a state of readiness to respond to stimuli. Attention abilities decline during ageing. Poor selective and divided attention were found to increase the risk of driving collisions (Anstey et al., 2005; De Raedt & Ponjaert-Kristoffersen, 2000; Stutts et al., 1998), hazardous street-crossing (Dommes & Cavallo, 2011, Dommes, Cavallo & Oxley, 2013) and hazardous obstacle negotiation (Brown et al., 2005).

The UFOV (Useful Field Of View) test is relevant for measuring selective and divided visual attention and is a good predictor of vehicle collisions in older drivers (Ball et al., 1993) and older pedestrians (Dommes & Cavallo, 2011, Dommes, Cavallo & Oxley, 2013).

Table 5 - Summary of the Studies about the Cognitive Functions and the Road Safety During Ageing

	Risks of collisions ➚	Driving skills ➘	Falls ➚, Balance & Walk ➘, Road crossing ➘
Memory	- Foley, Wallace, & Eberhard (1995) - Hu, Trumble, Foley, Eberhard, & Wallace (1998) - McKnight & McKnight (1999)	- Baldock, Mathias, McLean, & Berndt (2007) - Stutts, Stewart, & Martell (1998) - Szlyk, Myers, Zhang, Wetzel, & Shapiro (2002) - Zook, Bennett, & Lane (2009)	
Attention and visuospatial skills	- Anstey, Wood, Lord, & Walker (2005) - Clay et al. (2005) - Daigneault, Joly, & Frignon (2002) - Lundberg et al. (1997) - Stutts et al. (1998) - Ball, Owsley, Sloane, Roenker, & Bruni, 1993	- Anstey et al. (2005) - Baldock et al. (2007) - Clay et al. (2005) - De Raedt & Ponjaert-Kristoffersen (2000) - Richardson & Marottoli (2003) - Selander, Lee, Johansson, & Falkmer (2011) - Zook, Bennett, & Lane (2009)	- Brown, McKenzie, & Doan (2005) - Dommes & Cavallo (2011) - Dommes, Cavallo & Oxley (2013)
Processing speed	- McKnight & McKnight (1999) - Shanmugaratnam, Kass, & Aruda (2010)	- Baldock, Mathias, McLean & Berndt (2006) - De Raedt & Ponjaert-Kristoffersen (2000) - Lundberg et al. (1997) - Shanmugaratnam et al. (2010)	- Dommes & Cavallo (2011) - Dommes, Cavallo & Oxley (2013) - Holtzer et al. (2007) - Welmerink, Longstreth, Lyles, & Fitzpatrick (2010)
Executive functions	- Daigneault et al. (2002) - Stutts et al. (1998)	- De Raedt & Ponjaert-Kristoffersen (2000) - Shanmugaratnam et al. (2010) - Chaparro, Wood, & Carberry (2005) - Hancock, Lesch, & Simmons (2003) - Wood (2002)	- Dommes & Cavallo (2011) - Dommes, Cavallo & Oxley (2013) - Hawkes, Siu, Silsupadol, & Woollacott (2012) - Lindenberger, Marsiske, & Baltes (2000) - Neider et al., (2011)
Decision making		- Borowsky, Shinar, & Oron-Gilad (2010) - Mather, Gorlick, & Lightall (2009)	- Lobjois & Cavallo, 2007; 2009

The speed of processing refers to the rate at which information is taken from the senses, processed and used in order to comprehend or react. The duration to process information increases during ageing and affects road safety. Low speed of processing is associated with poorer driving performance (Baldock et al., 2006; De Raedt & Ponjaert-Kristoffersen, 2000), higher risk of collisions (McKnight & McKnight, 1999; Van Elslande, 2003), more hazardous street-crossing (Dommes & Cavallo, 2011; Dommes, Cavallo & Oxley, 2013), and more risks of falls (Welmerink et al., 2010).

Executive functions refer to the higher level cognitive processes that control and regulate thoughts and actions. The efficiency of executive functions is affected by ageing; the ability to select and update relevant information, to inhibit irrelevant information and to switch between tasks (shifting) decreases during ageing. Poor executive functions are linked to poorer driving performance (Chaparro et al., 2005; De Raedt & Ponjaert-Kristoffersen, 2000; Wood, 2002), higher risk of collisions (Daigneault et al., 2002; Stutts et al., 1998), and more hazardous street -crossing (Dommes & Cavallo, 2011; Dommes, Cavallo & Oxley, 2013). Dual-tasks (e.g., talking and walking, or crossing a road and conversing on a cell phone) are particularly difficult for elderly adults and significantly alter driving and pedestrian safety (Hancock et al., 2003; Hawkes et al., 2012; Neider et al., 2011).

Lastly, decision making refers to the construction of plans and actions among several alternative possibilities in order to resolve a discrepancy between an initial state and a desired end state. Elderly adults have poorer decision making than young adults when the decision has to be made quickly. Poor decision making is associated with a higher risk of driving collisions (Shanmugaratnam et al., 2010) and more hazardous street-crossing (Lobjois & Cavallo, 2007; 2009).

In conclusion, a number of results show that the cognitive decline associated with normal ageing alters the safety of elderly road users. More studies are needed regarding other modes of transport than driving (e.g., pedestrians, cyclists and users of public transport). The cognitive declines are larger during pathological ageing and significantly impede the safety of road users.

Links Between Cognitive Changes and Road Safety: Pathological Ageing

Cognitive functioning is altered during illnesses such as mild cognitive impairment, Alzheimer’s disease, or Parkinson's disease. Although controversial, mild cognitive impairment (MCI) is often regarded as a transitional syndrome between normal and pathological cognitive ageing (i.e., Alzheimer’s disease and other dementia). Older adults with MCI perform worse on cognitive tasks than a normal ageing sample, but better than a sample with senile dementia. MCI prevalence varies from 3% to 53% according to the MCI criteria considered (Lopez et al., 2003).

MCI seems globally associated with subtle functional decrements including driving tasks such as left turns (right turns in the UK), lane control, maintaining appropriate speed and gap judgments during on-road driving assessments. However, these performance decrements do not seem to reach a level that significantly affects driving safety (Wadley et al., 2009). Regarding mobility, elderly adults with MCI tend to drive shorter distances, do not venture as far from home and the frequency of their trips is reduced (O’Connor, Edwards, Wadley, & Crowe, 2010). Again, mobility limitations may reflect an awareness of driving difficulties and may thus be an appropriate behavioural adaptation to cognitive declines.

Data from European countries reveal that the overall prevalence of males and females with Dementia Alzheimer's Type (DAT) is high and increases dramatically with ageing (EUROCODE, 2006). The mean prevalence is 1.6% in the age range 65-69, which increases to 7.4% in the age range 75-79, and reaches 26.2% in the age range 85-89. In the early stage of DAT, memory and attention are predominantly impaired. Cognitive impairments become more serious and greater during the development of the illness. Memory, attention, language, orientation, decision making and visuospatial skills are commonly impaired during DAT. According to the progress of the illness, three DAT stages have been described: mild, moderate and severe.

Specific unsafe driving behaviours such as more errors at junctions, less awareness of other drivers, worse lane control, more frequent and unexpected braking are more often observed in DAT than during normal ageing (Duchek et al., 2003). Driving performance is affected early in the illness with nearly half of the drivers suffering from DAT failing the driving test proposed by Duchek et al. (2003). However, some discrepancies appear between driving evaluations carried out on the road or simulated driving tests and the real-life frequency of collisions. Indeed, despite worse performances than the normal elderly adults during driving evaluations, no significant differences are generally observed between DAT patients and non-DAT older adults regarding the frequency of car accidents and traffic violations (Frittelli et al., 2009; Trobe, Waller, Cook-Flannagan, Teshma, & Bieliausks, 1996). This discrepancy can be explained by the fact that a large number of DAT patients cease driving or have a reduced driving exposure and/or tend to drive in lower-risk conditions (Trobe et al., 1996). Indeed, the accident rate per mile or kilometre driven is higher for DAT patients than in the normal older population (Zuin, Ortiz, Boromei, & Lopez, 2002). Research on modes of transport other than driving is quite scarce. Some data suggest that older pedestrians with DAT are also potentially concerned by a reduced gait speed and an increased risk of falls (Alexander, Mollo, Giordani, & Ashton-Miller, 1995; Nakamura, Meguro, & Sasaki, 1996) and accidents when crossing the road (Gorrie, Brown, & Waite, 2008).

Parkinson's disease (PD) is a chronic neurodegenerative disorder characterised by a combination of motor, (i.e., tremor, rigidity, and bradykinesia), cognitive, and affective abnormalities. Parkinson's disease is relatively common: the overall prevalence (per 1000 population) in persons 65 years of age and older is around 18 in Europe (De Rijk et al., 2000). Cognitive impairments are very common during PD with 40% to 80% of sufferers being affected by dementia and more subtle cognitive impairments are present in a large number of sufferers (Rosenthal et al., 2010).

Some researchers suggest that PD is associated with an increased risk of hazardous driving and collisions (Amick, Grace, & Ott, 2007; Stolwyk, Charlton, Triggs, Iansek, & Bradshaw, 2006; Zesiewicz et al., 2002). With regard to mobility, drivers with PD are more likely to cease driving than those not suffering from PD. This can be partly explained by an awareness of cognitive dysfunctions amongst those affected (Cubo et al., 2010; Uc et al., 2011). It can thus be considered as a means of avoiding accidents. Finally, PD is also associated with an increased risk of dangerous crossing decisions leading to collisions with approaching cars (Lin, Ou, Wu, & Liu, 2013).

Discussion

Several studies have shown links between cognitive functioning and driving safety (see Adler, Rottunda, & Dysen, 2005; Stutts et al., 1998). However, neuropsychological tests should be employed with care. Indeed, the link between neuropsychological test performance and collision involvement is weak maybe because these tests and the accident occurrence do not measure exactly the same underlying abilities. Neuropsychological tests are relevant tools for screening and the detection of cognitive deficits that could affect road safety. However, these tests should not be used as the sole diagnosis tool to decide on driving abilities. An appropriate response to individual poor test scores should include additional questioning, knowledge testing and on-road driving tests.

Driving restrictions applying to Alzheimer sufferers vary between European countries (Alzheimer Europe Association, 2011). In several countries, medical practitioners are legally obliged to report to the relevant authorities any patient with a medical condition which makes him or her unfit to drive, including Alzheimer's disease. However, the obligation could affect the confidentiality between the practitioner and the patient. A consensus exists about the fact that the patients with moderate or severe dementia should not continue to drive (Erten-Lyons, 2008). However, the question is more complex regarding patients with mild Alzheimers disease. Rather than the diagnosis itself, a real driving examination would be fairer in order to decide if the patient should be allowed to continue driving (Erten-Lyons, 2008; OECD, 2001). Another important point is to consider the "after" driving period and to help the patient find other modes of transport in order to support the mobility of the person (O'Neill, 2010).

In-car technologies may partially compensate for the cognitive declines associated with ageing but these technologies should target the specific needs of elderly drivers and take their special limitations into account (i.e. lower attention capacities, lower processing speed), so as to develop technologies and interfaces that are acceptable and accessible to the elderly drivers (Young & Bunce, 2011).

Future studies should focus on the deepening of our understanding of how cognitive changes due to ageing affect road user safety, and in particular to identify more reliable predictors of unsafe behaviour. As only very few studies have been conducted on elderly pedestrians, cyclists, and users of public transport, there is an urgent need for intensifying research on this topic.

Meta-cognitive Capacities and Self-Evaluation

Introduction

Meta-cognition refers to knowledge about cognition, as well as regulation of cognition and is particularly relevant when the individual is confronted with a new or complex situation (Valot, 2001). Self-evaluation and self-regulation associated with meta-cognition are therefore solicited during driving, walking and cycling as road users have to adapt their skills and behaviours to the task constraints, as well as to define goals and strategies.

Ageing is associated with several ongoing and insidious declines including sensorial, physical, and cognitive functioning, which may affect road safety. However, elderly people are usually aware of these declines and modify their behaviour on the road accordingly. Awareness of their vulnerability as a road user may well help elderly adults adjust their behaviour and be more prudent. For example, by avoiding situations known to be particularly difficult for them to handle, such as driving at night, crossing a complex junction, etc...

Lack of awareness corresponds to a discrepancy between one's perception of ability and one's actual ability (Marottoli & Richardson, 1998). Lack of awareness may result in behaviour that compromises road safety (Marottoli & Richardson, 1998). While self-evaluation is assessed in most of the studies by means of scales, it should be mentioned that self-evaluation is well-known to be a biased judgment process. At least 80% of people rate themselves as "above average" on a wide variety of activities, including driving (Walton & Bathurst, 1998; Wild & Cotrell, 2003 cited in McPeek, Nichols, Classen, & Breiner, 2011).

Self-evaluation and Self-regulation in Relation to Functioning Declines

The self-evaluation of sensorial, physical, and cognitive declines can offer feedback about the need to self-regulate road behaviour. Older adults seem to become aware of their declines in situations where they become obvious. As diminished night vision is a very common problem reported by elderly drivers, more than half of them avoided night driving due to poor vision skills (Charlton et al., 2006). Older adults become even more aware of their visual declines when vision illnesses such as glaucoma or cataracts are diagnosed and report more avoidance of driving situations and fewer days of driving per week than older drivers who are not diagnosed to have ocular disease (Ball et al., 1998). Similarly, elderly pedestrians who felt that their vision has deteriorated tend to report more self-regulation such as avoiding crossing the road at night or in bright light or glare, or crossing the road without a pedestrian crossing (Holland & Rabbitt, 1992).

Physical declines, such as hip fracture, knee replacement and arthritis are frequently mentioned by elderly drivers as having "a little" to "a great" impact on their general driving behaviour (Ruechel & Mann, 2005). Elderly adults who self-evaluate a decline of their ability to walk are shown to be more disposed to admit to modifying the way they drive, or to not driving in adverse conditions (Kostyniuk & Molnar, 2008).

Elderly drivers that accurately self-rate their reduced cognitive functioning (i.e., memory, concentration, orientating, reacting too slowly, etc.) admit to adopting a more strategic and cautious driving style than older drivers with a more optimistic self-evaluation (Meng & Siren, 2012). In accordance with changes reported in the literature (Anstey et al., 2005), these drivers were more likely to report a decline in their driving skills linked to sensorial, physical or cognitive functioning (e.g. manoeuvring the car when it is slippery, reacting to unforeseen events in the traffic) than events linked with general knowledge and wisdom associated with driving (e.g. be patient with other road users, adjust the speed to the traffic). Additional studies are necessary to better understand the relationship between cognitive declines, self-evaluation of cognitive declines, and self-regulation. A potential explanation for this complex relationship is that self-regulation is a consequence of a feeling of discomfort due to an increased cognitive load during challenging driving situations (Meng & Siren, 2012).

Self-evaluation and Self-regulation in Elderly Drivers

Few studies have investigated the link between self-evaluation of elderly drivers' performance and their self-regulation on the road. However, studies tend to suggest that elderly drivers have a poor insight into their own driving ability (Horswill, Anstey, Hatherly, Wood, & Pachana, 2011; Marottoli & Richardson, 1998). For example, the actual performance of elderly drivers in assessing a hazard during driving was not related to their self-estimation of this performance (Horswill et al., 2011). Similarly, on-road driving performance and a history of adverse events were not associated with self-evaluation of driving ability (Marottoli & Richardson, 1998).

The disparity between self-evaluation of driving ability and actual driving performance could be explained by the tendency of elderly adults to put themselves in a positive light in overestimating their ability to drive (Freund, Colgrove, Burke, & McLeod, 2005). Recent data showed that elderly drivers justify their self-regulation behaviour more as a response to external risk factors (e.g. inappropriate behaviour of other road users, bad road conditions, etc.) rather than as a consequence of their own reduced ability (Siren & Rishoj Kjaer, 2011).

Several self-regulation driving behaviours have been reported in the literature (Baldock et al., 2006, Ball et al., 1998; Benekohal et al., 1994; Charlton et al., 2006): older people drive fewer kilometres per year, avoid driving at night or during heavy traffic and avoid driving on unfamiliar roads or in bad weather. They also drive more slowly than other drivers, avoid driving on high-speed roads and drive further away from the car in front. They look for bigger gaps in traffic when turning at junctions and avoid parallel parking. Finally, they drive less for recreational or social trips and more for grocery and other shopping trips compared to their younger counterparts. The situations most avoided are those in which the drivers have low confidence and are the easiest to avoid. (Baldock et al., 2006).

Self-regulatory behaviour adopted by elderly drivers has been shown to be successful in reducing the risk of collisions (De Raedt & Ponjaert-Kristoffersen, 2000). Driving fewer kilometres per year reduces risk. Indeed, the higher collision risk per kilometre observed in drivers over 80 years old is offset by the reduced distance they drive each year. This should be taken into account when assessing the overall risk to this group of drivers. (Fontaine, 2003; Langford, Methorst, & Hakamies-Blomqvist, 2006).

Self-evaluation and Self-regulation in Elderly Pedestrians

There are relatively few studies of self-evaluation by elderly pedestrians; however those that exist show self-estimation of walking speed to be imprecise. Adults in the 60-74 age range tend to under-estimate their walking speed whereas those who are older than 75 years tend to over-estimate. (Holland & Hill, 2010; Zivotofsky et al., 2012). The poor accuracy of these estimates may result in unsafe road crossing decisions.

A frequent issue in elderly adults is the fear of falling, which leads to individuals avoiding activities that they are competent to perform. (Tinetti & Powell, 1993). The fear of falling increases with age (Legters, 2002), and is more prevalent in women than men. Elderly adults with a history of falling tend to have a greater fear than those with no previous falls - (Scheffer, Schuurmans, van Dijk, van der Hooft, & de Rooij, 2008). Older pedestrians with a high fear of falling pay more attention to the condition of the walking surface and are more cautious compared to those with a low fear of falling (Avineri, Shinar, & Susilo, 2012).

Despite the paucity of data compared to driving, several self-regulation behaviours have been reported in elderly pedestrians. Walking speeds during road crossings are faster than during recreational activities due to the external pressure of traffic (Arango & Montufar, 2008). The increased walking speed reduces time spent on the carriageway and therefore reduces exposure to traffic. It also explains why elderly pedestrians prefer to use pedestrian crossings and signalised junctions when possible (Bernhoft & Carstensen, 2008). To avoid falls, elderly pedestrians also prefer the presence of a footway along their route with a smooth surface (Bernhoft & Carstensen, 2008). They are particularly worried by the risk of falls due to ice and/or snowy conditions (Wennberg, Stahl, & Hyden, 2009) and walk more slowly when it is snowing (Knoblauch, Pietrucha, & Nitzburg, 1996). Another self-regulatory behaviour is to maintain a larger personal space between themselves and other pedestrians in order to reduce the risk of bumping into someone and falling (Gérin-Lajoie, Richards, & McFadyen, 2006). More studies are necessary because the benefit of self-regulation on safety has not been fully investigated, for example there is little information on collision rates. Some self-regulation could actually have negative consequences on safety because older pedestrians with a high fear of falling pay more attention to obstructions in the footway and therefore pay less attention to traffic (Avineri, Shinar, & Susilo, 2012), which is a risky behaviour.

Driving Cessation

Driving cessation has been the subject of many studies, which have revealed that the extent of self-regulation is large and can range from no change in behaviour to complete cessation of driving, cycling or walking.

It is often a difficult decision to cease driving because it offers an important mobility option for most elderly adults. The major predictors of driving cessation are old age, retirement, reduced income and the presence of a neurologic or physical disease (Adler & Rotunda, 2006). Medical practitioners and relatives frequently have a large influence on the decision to stop driving.

Driving cessation is frequently associated with negative consequences such as depressive symptoms (Fonda, Wallace, & Herzog, 2001), a feeling of losing control (Windsor, Anstey, Butterworth, Luszcz, & Andrews, 2007), reduced mobility and out-of-home activities (Bauer et al., 2003; Fonda et al., 2001). In consequence, driving cessation should only be considered when it becomes necessary for road safety reasons.

Where there is a road safety risk, elderly adults should be offered advice about alternative modes of transport and encouraged to cease driving voluntarily. The development of social marketing campaigns that aim to make driving interventions more common and socially acceptable should be promoted (National Highway Traffic Safety Administration, 2001 in Bauer et al., 2003).

Discussion

Improving self-evaluation and self-regulation in elderly road users is a difficult task. We frequently talk about losses associated with ageing, for example physical or cognitive functions but emphasising a positive vision of ageing by highlighting the capacity of older people to compensate and adapt to new situations could be a better idea. This would encourage elderly adults to avoid risky situations, for example not driving at night or in bad weather and actions to reduce the risk of falling.

Self-rating questionnaires could help to improve the self-evaluation of elderly adults and improve their skills and on-road behaviours (Holland & Rabbitt, 1992). Even if self-evaluation is often biased, older adults could become more aware of their difficulties when confronted with their assessments. Consequently, educational intervention aiming to improve the self-evaluation of age-related declines and to promote self-regulation among elderly adults may be an effective mode of action to increase their safety on the road (Stalvey & Owsley, 2000). The barriers to self-regulation are; a lack of public transport, a reluctance to change lifestyle, an unwillingness to ask family and friends for lifts in their vehicles. These factors are often reported by elderly drivers to justify their lack of self-regulation strategies (Baldock et al., 2006; Stalvey & Owsley, 2000), interventions should address these barriers in order to promote self-regulation strategies.

In conclusion, self-regulation refers to the ability to assess one's performance and adjust one's behaviour in accordance with this assessment (Baldock et al., 2006). The spectrum of self-regulation is large and can range from no change to driving, cycling or walking, to complete cessation. The factors that cause older road users to stop driving are well understood, but further work is needed to fully understand cycling and walking behaviours in old age.

Studies have suggested a positive effect of self-regulation on older drivers' collision rates (De Raedt & Ponjaert-Kristoffersen, 2000; Langford et al., 2006), however future studies are necessary to investigate the benefit of self-regulation on the safety of elderly pedestrians, cyclists and users of public transport. Also more studies are necessary to better understand the role of self-evaluation because elderly road users with a lack of awareness of their actual abilities may engage in unsafe road behaviour or be reluctant to change their behaviour. In the same way, the success of elderly road users' training programmes could be dependent on the ability of elderly adults to recognise their limitations (Marottoli & Richardson, 1998).

Capacity of Learning and Adaptation, Possibilities of Compensation

Introduction

There is an accumulating body of evidence to show that impairments in one or more areas of functional ability (i.e. sensorial, physical, or cognitive functioning) significantly increase the risk of a collision, whether driving, cycling or walking. In addition, the extent to which older people are aware of the functional declines from which they suffer is crucial in the way they self-monitor and adapt their behaviour. Some older people recognise that they suffer from declining changes and spontaneously adopt compensatory strategies.

Adaptation can also be promoted by policy measures, road environment modifications, enforcement, and training interventions.

Researchers, national governments and local authorities have proposed, and in some cases tested several interventions, including training and counselling to promote adaptation and adoption of compensatory strategies, with the objective of improving mobility and decreasing the collision risk for elderly road users.

Review of Existing Research on Interventions and Training for Elderly Road Users

Most of the interventions and training programmes developed for elderly road users focused on the identification of particular driving impairments, changing driver behaviour, improving driver knowledge and promoting behavioural strategies for safer driving. However, relatively little research has directly targeted training for older people as pedestrians, cyclists or motorcyclists.

Given the multi-dimensional aspect of driving and pedestrian-task constraints, different interventions have been proposed to specifically improve the physical, cognitive and strategic components of mobility.

Physical exercise training programmes have been shown to be useful for elderly road users. Exercise programmes that improve shoulder and neck flexibility and trunk rotation have a positive effect on observing skills during driving (Ostrow, Shaffron, & McPherson, 1992) and on-road driving performance (McCoy, Tarawneh, Bishu, Ashman, & Foster, 1993). Stretching exercises (Verfaillie, Nichols, Turkel, & Hovell, 1997) and Tai-Chi programmes (Gatts & Woollacott, 2006) improve gait in the elderly and are enthusiastically accepted by elderly people (Maciaszek & Osiński, 2010).

Figure 4 - Use of Tai Chi Training in Order to Improve Balance and Flexibility (Current.com website, 2011)

Despite the lack of data, cycle training for elderly people seems to have focused on promoting balance and postural control (Tyree, 2010).

Cognitive training aims to reduce declining cognitive performance by targeting specific skills involved in driving, cycling, or pedestrian activities. However, most of the studies concerned with mobility focused on older drivers. Some training has targeted the useful field of view (UFOV). This is the area from which one can extract visual information in a single glance without eye or head movement (Roenker et al., 2003). This training involved practising visual attention skills including the rapid identification and location of visual information in increasingly demanding visual displays (via the UFOV® training software, Visual Awareness, Inc., Chicago, IL). UFOV training programmes resulted in lower rates of at-fault collision involvement over a 6-year period compared with participants from an untrained control group (Ball, Edwards, Ross, & Mc Gwin, 2010). UFOV training programmes also resulted in fewer dangerous manoeuvres during an on-road driving evaluation (Roenker, Cissell, Ball, Wadley, & Edwards, 2003). Lower rate of at-fault collision involvement on a 6-year period was also observed after a reasoning training (e.g. learning to resolve problems). Finally, training that aims to improve navigation has also shown interesting results (Hale et al., 2011; Lövdén et al., 2012).

Education programmes aim to improve knowledge and understanding of the rules and the correct behaviour to adopt on the road. However, these types of programmes showed only limited success in reducing collision rates (Owsley, McGwin, Phillips, McNeal, & Stalvey, 2004, see also Bédard, Isherwood, Moore, Gibbons, & Lindstrom, 2004). In fact, educational interventions were shown to increase driving awareness and knowledge, but failed or did little to reduce collision rates and improve safety and behaviour on the road, which requires practice in traffic situations.

The combination of behavioural training and education programmes appears to be particularly effective in increasing awareness, knowledge, skills and safety on road. The aim of behavioural training programmes is to directly address elderly road users' behaviour and practical skills on road through repeated practice in real or in simulated environments. Regarding driving, the combination of classroom and on-road training resulted in an improvement of both driving performance and driving knowledge (Bédard et al., 2008;

Marottoli, Allore et al., 2007). Apart from studies on road design and speed-limit countermeasures, there is surprisingly little road-safety research on behaviour-based measures to improve older pedestrians' safety. The initiative of Dommes, Cavallo, et al. was the first one to be published (Dommes & Cavallo, 2012; Dommes, et al., 2012). The programme combined behavioural and educational interventions through repeated practice on a street-crossing simulator, including feedback. Results showed significant group differences immediately after training. For example, intervention group participants crossed more rapidly, adopted larger safety margins and took fewer unsafe decisions than participants of an untrained control group. However, 6 months after training, significant group differences were no longer observed. Improvements in street crossing decisions and behaviour was apparent for both intervention and control groups. These results indicate a clear shift of the decision criterion towards improved safety for all participants over time. However, the ability to take into account the speed of approaching vehicles did not improve. This finding may reflect age-related perceptual and cognitive difficulties that cannot be remedied by a behavioural or educational training intervention. Regarding cycling, training for middle-aged adults (87% of the 113 participants ranged in age from 25 to 54 years) suggested an increase of self-reported skills and confidence in cycling after 6 hours of training targeting skill development and supervised on road training (Telfer, Rissel, Bindon, & Bosch, 2006).

The adoption of compensatory strategies, through training and awareness of decline programmes, is also an effective means of maintaining elderly road users' mobility as long as they are able to drive, walk or cycle. If compensatory strategies are not successful in preventing repeated accidents, the elderly road user must stop driving, walking, or cycling. Older drivers appear to be reluctant to plan for driving cessation. However, driving cessation seems to be facilitated when the decision is made by the drivers themselves, i.e. without the intervention of others (Bauer, Rottunda, & Adler, 2003). Access to sustainable mobility options and more generally a feeling of control over mobility are beneficial to driving cessation. To help older adults find alternative modes of transport is clearly an urgent problem, especially in rural environments. A recent study highlights the beneficial effect of counselling on alternative modes of transport to encourage older adults to make more use of buses and other public transport facilities (Stepaniuk, Tuokko, McGee, Garrett, & Benner, 2008). During the training session of two hours conducted in small groups of six to eight participants, bus schedules and large print detailed pamphlets about how to use the public transport system were given to older people.

Discussion

Older people are good candidates for training interventions due to their motivation to continue driving, walking or cycling. Generally, they also have time to attend training sessions. The reasons for individuals attending training courses have been shown to be linked to their motivation to learn and their expectations of the benefits gained (Husband, 2010). The promotion of training courses should therefore emphasise the benefits of attending (e.g. increased knowledge and safety).

Multi-action approaches, including innovative measures referred to above are promising and worth exploring further to improve the safety of elderly people on the road. Together with an educational intervention (targeting self-awareness and self-regulatory practices), training in the basic tasks of driving, cycling or crossing could be a successful method for improving the mobility of elderly people.

An increasing number of local and national governmental initiatives are being implemented to address elderly road users' safety. However, most of them have not been systematically evaluated. This may be due to time constraints or a lack of knowledge or resources to implement an evaluation (Husband, 2010). More communication between researchers and local and national authorities is increasingly necessary to exchange knowledge. The interventions should be systematically and objectively evaluated (Dunbar et al., 2004) and the use of a methodology that compares an intervention group with a non-intervention group is recommended. Criteria for measuring the effectiveness of training interventions needs also to be established. The use of collision data appears to be the best measure but is often complex to obtain, explore and interpret, which is discussed in Work Package 2.

Action1.12 – 1.15: Sociological Factors

Introduction

During ageing, the use of the car decreases and the use of public transport and walking are more frequently cited as the most important modes of transport (Transport for London, 2007). Adaptation to functional declines was reported in the previous section but this mobility pattern could also be explained by sociological and demographic factors linked to the individual, for instance gender, very old age, ownership of a driving licence and income. Another explanation could be environmental factors, for example public transport costs, the proximity of bus stops and the availability of local services. A good understanding of these factors is necessary to offer more appropriate modes of transport for the elderly.

Review of the Main Sociological Characteristics that Influence Elderly Road Users' Mobility

At the present time, a substantial percentage of elderly adults do not possess a driving licence, particularly elderly women (Siren & Hakamies-Blomqvist, 2006). However, this trend may change in the future because a greater percentage of younger women are drivers compared to previous generations. The increase in the number of women drivers over 60 years of age will therefore increase the proportion of elderly drivers in the future (OECD, 2001).

The mobility patterns of elderly women are largely influenced by the fact that fewer of them hold a driving licence compared to elderly men. Therefore, elderly women are highly dependent on their spouses, children and others for travel by car and most reported that someone gave them lifts on a regular basis. However, few elderly men reported the same dependency (Siren & Hakamies-Blomqvist, 2006). The difference in access to cars between elderly men and elderly women could explain why elderly women walk more frequently (Siren & Hakamies-Blomqvist, 2006) and use public transport more than elderly men (Transport for London, 2007).

Mobility patterns of elderly road users also seem to vary with increasing age and are concentrated among very old adults and those who are limited in their abilities (Mollenkopf et al., 1997). The number of journeys per day decreases with age and is most pronounced in those older than 80 years (Heam & Dejeammes, 2000). The negative effect of very old age is actually linked to the increase in health problems. Walking and the use of public transport seem to be more affected by these health problems than the use of car (OECD, 2001). This is interesting because health problems are frequently cited by authorities as a justification for driving cessation in elderly adults, whereas walking and using public transport seem to be affected earlier than driving.

The transportation needs of elderly adults change when the time to stop driving arrives. The age of driving cessation varies a lot between elderly adults and is influenced by gender because elderly women tend to stop driving at a younger age and in a better health than elderly men (Siren & Hakamies-Blomqvist, 2006). The availability of alternative modes of transport also has a great influence on this decision (Simms, 1993) because drivers in towns and cities are more likely to stop driving than those in suburbs and rural areas (OECD, 2001). These observations revealed that elderly adults living in rural areas are more at risk by continuing to drive because they are often not able to do it safely.

Living in an urban area offers more alternative modes of transport to the car than living in a rural area. The use of public transport is facilitated by its greater availability in urban areas compared with rural areas. For example, elderly adults use public transport about eight times more in the most urbanised areas of London than in rural areas (in Schmöcker, Quddus, Noland, & Bell, 2008). Due to the lack of public transport, people living in rural areas are more dependent on the car and report that this reduces their ability to participate in their desired activities (Mollenkopf et al., 1997).

Another factor that influences transport choices in elderly adults is cost. Probably because they have less money but more time than younger adults, the travel cost has a larger influence than the travel time on their choice of transport (Su & Bell, 2009). The high cost of car ownership may sometimes speed up driving cessation (OECD, 2001; Simms, 1993; Unsworth, Wells, Browning, Thomas, & Kendig, 2007). This finding highlights the necessity of developing less expensive alternative modes of transport. Several authorities have introduced reductions or free passes to encourage elderly adults to use public transport (Webb, Netuveli, & Millett, 2012), thereby increasing the use of bus by the elderly (National Travel Survey, 2009; Webb et al., 2012).

In addition to cost, the use of public transport is also influenced by the proximity of bus stops. The close proximity of stops encourages older adults to use the bus, whereas the frequency of the bus service does not appear to have the same impact (Su & Bell, 2009). Even if older adults generally have the time to walk, physical limitations can make walking to bus stops or transferring between stops a difficult task (Schmöcker et al., 2008). Hence, elderly adults appreciate buses that can be hailed anywhere along the road because this added flexibility reduces the distance to walk. In the case of severe physical limitations, some local authorities provide door-to-door services such as dial-a-ride for elderly adults and people with disabilities who are not able to use public transport, or who cannot be driven by family or relatives (Schmöcker et al., 2008).

Discussion

The mobility of elderly adults needs to be reviewed because, at the present time, there is an over-dependence on the car, which has mobility, safety and health implications. Mobility for elderly road users could be improved by several means.

Firstly, walking should be promoted for short and medium length trips. The attractiveness of walking could be improved by providing broad and comfortable surfaces, avoiding steps and increasing the number of traffic-free zones and pedestrian crossings (Borst et al., 2008; 2009; Mollenkopf et al., 1997). Another means to promote walking is to increase the provision of benches and toilets in the public environment (Risser et al., 2010).

Public transport is an efficient complement to walking but before promoting the use of buses for the elderly, some improvements should be made because many elderly adults report a fear of falling when boarding or alighting from a bus, or during hard acceleration or braking by the driver (Kirk, Grant, & Bird, 2001; Mollenkopf et al., 1997). Another recommendation is to offer an improved network of public transport in order to reduce car dependency by elderly adults. Particular attention should be given to rural areas because elderly adults living there have mobility problems due to the paucity of public transport options.

Another recommendation is to promote the use of public transport by elderly adults by providing free passes or at least reducing the cost of travel. Some relatively easy actions such as increasing the number of bus/tramway stops could also promote the use of public transportation by elderly adults. More than a 5-minute walk to reach a bus stop or transfer between stops is to be avoided (Nitta, 1998, cited in Schmöcker et al., 2008). Finally, the development of door-to-door services adapted to elderly adults with strong mobility disabilities is to be encouraged (Ben-Avika, Julian, Lauprete, & Polydoropoulou, 1996, in Schmöcker et al., 2008).

Training and support programmes are also needed for older drivers to enable them to continue driving safely for as long as they are able but, at the same time, there needs to be encouragement to reduce their dependency on the car and promote the use of other means of transport. Older people who have ceased driving for health reasons should also be advised of the potential risks of walking and cycling.

Conclusions of WP1 Information Gathering

Addressing the safety and mobility of elderly road users is becoming an urgent issue because the number of elderly adults is growing and their life expectancy is increasing. In addition, older road users are over-represented in road accidents. Unless there are marked improvements in the safety and use of roads and vehicles, there will be a significant increase in fatalities and serious injuries for older road users. These will be greater than for any other age group.

The safety and mobility of elderly road users are challenged by several age-related changes, including sensorial, physical, cognitive, and metacognitive abilities, as well as by medication and alcohol intake, and by some sociological factors, for example income and living environment. Local authorities and national governments have to face these substantial challenges to develop integrated approaches that support safety and mobility. Actions include the development of safer roads and infrastructure, vehicle design and new technology, public transport options, and the promotion of safer practices through education, publicity and training programmes.

Safer Roads and Infrastructure

The modification and adaptation of the road infrastructure is an efficient means to improve the safety and mobility of elderly road users. Safer roads and roadside environments should be provided to older drivers, pedestrians and cyclists. Established techniques for allowing a safer co-existence between all road user groups are slowing traffic and lowering speed limits, as well as altering road environments by improving junctions and the implementation of traffic calming measures and reducing carriageway widths (OECD, 2001).

Another excellent safety measure is to make residential and recreational environments different from areas where cars predominate and where pedestrians, cyclists and other vulnerable road users are concentrated. The change of environment should indicate to drivers that they must slow down and give priority to pedestrians and cyclists. Well designed traffic calming zones where the speed limit is 30 km/h (20mph) will achieve these objectives. However, the effectiveness of these measures and their acceptance by the public should be underpinned by selecting high-risk locations with a history of collisions or where the presence of traffic has created environmental problems, particularly for the elderly (OECD, 2001).

Some infrastructure adaptations are also particularly relevant to facilitate and/or reduce the older drivers' need to make complex decisions and perform time-related tasks (OECD, 2001). For example, the development of appropriate street lighting systems and carriageway markings at junctions, dedicated turn lanes and traffic signals allowing protected turns and prohibiting dangerous turns, wider carriageway lanes and raised islands at road junctions. To make driving easier and safer for the elderly after dark, the reflectivity of traffic signs and carriageway markings should be increased and larger sign symbols and lettering provided.

The accuracy of driving manoeuvres could be improved by more relevant and timely information, a reduction of speed in areas where complex manoeuvres are required, a longer visibility distance and the appropriate siting of signs and signals to aid visual recognition.

To answer the specific needs and challenges of pedestrians, pedestrian-friendly zones are being increasingly adopted throughout European countries (Zegeer & Bushell, 2012). Their main features are lowering the speed of vehicles to 30kph (20mph) and providing large and flat surfaces, landscaping with trees, shrubs and flowers (OECD, 2001). All these elements contribute to reducing vehicle speeds as well as making more environmentally attractive streets.

The safety of elderly adults could be further improved on major arterial roads by providing central pedestrian refuges in association with pedestrian crossings to allow crossing in two stages (Gitelman, Balasha, Carmel, Hendel, & Pesahov, 2012; OECD, 2001). Other improvements are kerb extensions to reduce exposure time on the carriageway, bollards that prevent pedestrians being obstructed by parked vehicles and adequate footpath widths (OECD, 2001). Improving the quality of footpath and pedestrian-crossing surfaces as well as avoiding abrupt changes in level are required to improve the mobility and confidence of elderly pedestrians (OECD, 2001). Measures for traffic signals such as adding flashing red lights to pedestrian signals, countdown signals to inform pedestrians of the end of clearance time, or audible signs with "walk" phases are effective ways to improve elderly pedestrians' safety on the road. PUFFIN (Pedestrian User Friendly INtelligent) crossings allow the green signal to match the time required by pedestrians to cross the road by tracking movements through the use of infrared detectors or other devices. This type of crossing was first introduced in the United Kingdom (OECD, 2001) and is shown to reduce collisions.

Separate cycle paths are accepted as an efficient means to improve cyclists' safety (OECD, 2001) and reduce the number of collisions (Thomas & DeRobertis, 2013). However, conflicts between cyclists and turning or merging vehicles at junctions are often observed as a major risk. To overcome these conflicts, additional lanes at junctions should be provided. Conflicts between cyclists and pedestrians are also observed at junctions and elderly pedestrians are often concerned at the presence of cyclists on the footway (Bernhoft & Carstensen, 2008). More research is needed to identify other changes to road infrastructure that could allow greater safety to older pedestrians and cyclists, without impairing the mobility of other road users (OECD, 2001).

Vehicle Design and New Technology

Due to increasing frailty with age, elderly people are more likely to suffer serious or fatal injuries in collisions. Therefore, car manufactures must improve the "crashworthiness" of vehicles, including seat belts, airbags, vehicle mass, vehicle shape, etc. The user-friendliness of vehicles for older people should also be of particular interest (OECD, 2001).

The main design-related issues to consider are; providing a comfortable driving position, ease of getting in and out of the car, using the radio, reversing and parking, operating the boot or hatch and ease of wheel changing (Herriotts, 2005). Careful attention to the design of vehicles and their equipment will benefit older people by mitigating the effect of age-related physical declines. For example, attention to the height of the doorframe, width of the door aperture, height of the sill from the ground, depth of the sill, seat height and the presence of handholds on the doorframe should, for example, be designed to facilitate access to the car by older people (Herriotts, 2005; OECD, 2001). Ease of driving could be improved by power steering (now standard on many new cars), automatic transmissions, adjustment of the driving position and additional rear-view mirrors (OECD, 2001). Seat design should not restrict turning and rear pillar obscuration must be minimised (Herriotts, 2005). Vehicle seating should be relatively flat to facilitate sitting down and to move comfortably once in the vehicle (Shaheen & Niemeier, 2001). The concerns about radio use are due to their increased complexity and the resulting potential for distraction (Herriotts, 2005). The provision of simple controls on the steering wheel to operate the radio could be a way to limit distraction. The design of handles, knobs and steering wheels should be adapted to mitigate the limitations often encountered by elderly adults suffering from arthritis. The forces and pressures required for operating controls should therefore be reduced (Shaheen & Niemeier, 2001).

More attention should be given to in-car assistance technologies for improving vehicle control and safety. For example, blind spot warning systems, lane keeping assistance, collision mitigation braking systems, etc. are now available and may have the potential to partly compensate for age-related declines (Mitchell & Ling Suen, 1998; Shaheen & Niemeier, 2001). However, the development of these technologies appears to have ignored the specific needs and limitations of older drivers. A potential risk of these assistance systems is to overload the attentional resources of the driver and to provoke additional stress. This risk is even greater for elderly adults because attentional resources are reduced with normal ageing. Consequently, Advanced Driver Assistance Systems (ADAS) should be developed in full consultation with elderly drivers and experts on ageing, since designers are often young adults with little knowledge of the elderly driver's specific needs (Musselwhite & Haddad, 2007). The user-friendly aspect of these devices is particularly important for elderly adults (Pauzié, 2003) and training programmes could allow them to become familiar with the use of these systems (Simoes, 2003).

Technological innovations that specifically benefit elderly pedestrians and elderly bus users are scarce but they would be welcomed by these older groups. Crossing the road is a potentially dangerous task and the fear of being struck by traffic could impede mobility. Elderly adults are frequently fearful of not having sufficient time to cross safely. PUFFIN crossings address this by adapting the crossing time to the pedestrian speed and pedestrian flow (Mitchell & Ling Suen, 1998).

The development of sophisticated navigation systems that combine directional indications and hazard warnings would be particularly beneficial for the safety and mobility of elderly pedestrians with poor vision. In the same way, the availability of systems displaying the name of the next stop inside the bus will increase the safety of bus users by giving more confidence and extra time to alight (Mitchell & Ling Suen, 1998).

Education, Publicity and Training

Safer mobility for elderly road users could be achieved by the promotion of safer behaviour on the road through education, publicity and training. Public awareness of the mobility needs and safety difficulties experienced by older people should be raised through education, for example at school, during driving licence courses and extensive media campaigns. Actions aiming at changing public attitudes towards elderly road users must be based on research results to dispel misconceptions about older people's risks and mobility needs and provide accurate information (OECD, 2001). Education and publicity should also be aimed at older road users to help them become more aware of the risks they encounter and the declines from which they may suffer with increasing age. This could help them develop self-regulatory behaviour by driving shorter distances, avoiding driving or walking at night or in bad weather etc. and so reduce their risk of accidents.

Safer practices could also be achieved by training elderly road users to adapt their behaviour on the road. Older people are good candidates for training interventions due to their motivation to continue driving, walking or cycling. They also generally have time to attend training sessions (Husband, 2010). However, significant changes in behaviour are sometimes difficult to achieve and may take a long time. Elderly people are known to be conservative and reluctant to change their habits (Reich & Zautra, 1991). The combination of on-road training and in-class education appears to be particularly effective in increasing awareness, knowledge, skills and safety (Bédard et al., 2008; Dommes et al., 2012). Educational interventions alone show only limited success. Prevention strategies allow elderly adults to acquire knowledge and increase their understanding of task constraints. However, knowledge-enhancement approaches on their own fail or do little to decrease collision rates and improve users' road safety. This requires practice in traffic situations, which helps older adults cope with the progressive mismatch between their declining abilities and the large demands of driving, cycling or road crossing tasks. Repeated practice on road or in simulated environments together with an educational intervention appears to meet this goal. Multi-action approaches are promising and innovative measures are worth exploring further to improve the safety of elderly road users. Together with an educational intervention (targeting self-awareness and self-regulatory practices), training in the basic functioning of driving, cycling or crossing tasks could be a successful method for improving the mobility of elderly people. Physical exercise and/or cognitive training programmes are recommended. Exercise is known to enhance several physical abilities, as well as perceptual and cognitive skills relevant for driving performance and safety in older road users. Cognitive training also shows promising results through significant improvements of driving skills and increased driver safety after the intervention. This type of training aims at preventing declining cognitive performance by targeting specific skills involved in driving, crossing the road or cycling.

The difficulty of improving older road users' behaviour and skills has motivated some countries to develop medical assessments. However, the effectiveness of these age-based medical assessments is unclear and they are unlikely to produce safety benefits. They may even have counter-productive results (OECD, 2001). Indeed, many elderly drivers may prefer to cease driving rather that undergo a medical assessment (Hakamies-Blomqvist & Wahlstrom, 1998). This premature cessation is worrying because it could produce a substantial mobility loss (OECD, 2001). Furthermore, driving cessation is associated with greater use of walking as a mode of transport and therefore may increase the risk of pedestrian accidents (Hakamies-Blomqvist & Wahlstrom, 1998).

Currently available methodology is only capable of satisfactorily testing high risk elderly drivers suffering from serious sensorial or cognitive declines. However, it is difficult to detect all drivers who are at risk of collisions using current methodology and there is a probability of wrongly classifying some fit drivers as unfit. Therefore, it is necessary to develop and put in place improved regular and systematic tests of ability for elderly drivers. Driving evaluations therefore appear to be a more effective way to evaluate driving skills because functional consequences of physical and cognitive ageing vary considerably in elderly people.

Alternatives to the Car and Public Transport Options

Continued dependence on the car, as our principal means of transport, has safety and mobility issues as we become older. It is necessary to enable older people to continue travelling once they have stopped driving because the reduction in mobility can often result in increased isolation, loneliness, depression, reduced physical and mental health and a poorer quality of life. However, giving up driving is a sensitive issue because it can often have a major impact on mobility and independence. There must be encouragement and funding for European, national and local authorities to reduce their dependence on the car and encourage the use of other means of transport.

Providing alternatives to the car is one of the most important ways to maintain older people's mobility (OECD, 2001). The level of public transport provision is therefore a particularly important issue to consider for older people. Older adults often view the availability of public transport as limited or even non-existent, which they use as a reason to continue driving. Driving cessation and use of alternative modes of transport is dependent on the accessibility of public transport in the areas where elderly people live. Large towns and urban areas often provide more transport services than rural areas. However, these services are often poorly adapted to the specific needs of elderly people.

Older adults declare a preference for transport modes that are convenient, inexpensive and facilitate social contact (Tuokko, McGee, Gabriel, & Rhodes, 2007). An improved range of services with several options to enable older people to select the one that best suits their requirements for a particular journey is also needed (OECD, 2001). The options should include conventional public transport services that are easy to use and adapted to elderly adults and disabled people, as well as demand-responsive transport services, such as "dial-a-ride". Regarding conventional public transport services, the availability of support personnel for direct communication is appreciated by older users, rather than struggling with ticketing or interactive machines. The close proximity of bus stops encourages older adults to use buses, whereas service frequency does not appear to have the same impact (Su & Bell, 2009) because elderly adults generally have more time than young adults and are therefore less influenced by bus frequency. The physical limitations of the elderly can make walking to bus stops or transferring between stops a difficult issue and bus stops closer than a 5-minute walk appear welcome (Nitta, 1998, in Schmöcker et al., 2008). Even more appreciated are demand-responsive transport services that allow flexible routeing and scheduling of small/medium size vehicles operating in shared-ride mode between pick-up and drop-off locations according to the users' needs (Schmöcker et al., 2008). Buses/vehicles should be specially designed (e.g. low floor) and adapted to individuals with physical disabilities. Electric scooters for older adults able to use them could also be an interesting proximity service and an alternative mode of transport with a large autonomy (Su & Bell, 2009).

Work Package 2 - Accident & Traffic Offence Statistics

Introduction

This section of the report covers work package 2 which includes accident and traffic offence statistics. It provides analysis of accident statistics relating to older road users and investigates older people's vulnerability relating to accidents. There is particular focus on analysing accidents and the risks to pedestrians, motorcyclists and drivers. Traffic offences committed by older road users are also covered.

The main conclusions are that people are living longer and want to be more mobile as they age. The highest accident numbers involving older road users were car occupants and pedestrians for the four partner cities. The peak in accidents involving an older person is between 9:00 am and noon. Not surprising is the fact that only a few accidents involving older people happen between midnight and 6:00 am.

There is no consistency with collection of accident data between countries and there is a European-wide lack of robust research into the road safety of older pedestrians and poor data recording. Trips and falls which do not involve a collision with a vehicle are under recorded even though they may lead to long term disability and life-long mobility restrictions. The accident data analysis shows that if older people are involved in an accident they are more likely to be seriously injured.

There are considerable differences by age group and evidence shows that those aged 75 or older are most likely to experience problems which curtail mobility both as pedestrians and drivers. Evidence shows that older people tend to have problems assessing complex traffic situations, and need more time to process information.

The main cause of accidents involving older car occupants and pedestrians is 'distracted driving or indecisive behaviour' and 'failed to look properly'. Targeting people over 65 years of age is likely to achieve greater road safety and mobility benefits and in particular reduce dependency which has far wider benefits to society.

Recommendations

- National and local governments to have targets to reduce accidents involving older people. Targeting this age group is likely to achieve greater road safety and mobility benefits and in particular reduce dependency which has far wider benefits to society.
- To provide consistency of accident data collection in all countries.
- Accident data collection to include trips and falls and also data on health consequences and costs.
- Training and information to be provided for older road users as pedestrians, drivers, motorcyclists and cyclists. Training to include pedestrian crossings.
- Mandatory fitness to drive tests should be provided, which are not linked to age but instead to the health service. Further research is required into driver screening and assessments
- All stakeholders need to work in partnership to support the older person.
- Incentives to ensure and improve self-control and psycho-physical assessment.

- Helping other road users to understand the needs and problems of elderly people to improve intergenerational interaction in road traffic.
- Vehicle design to be considered and adapted for older drivers. To include In-Vehicle Information Systems (IVIS) and Advanced Driver Assistance Systems (ADAS) to support the older drivers' safety.
- Public transport design and provision to take account of older peoples needs.
- User oriented town planning - accessibility is more important than speed. Adaptation of traffic regulations and speed to take account of the older people's abilities.
- The design of infrastructure to take into account the needs of older people to include:
    - Advance warning signs
    - Advance guide signs and street name signs
    - Increase size and letter height of roadway signs
    - Protected left-turn signal phases or right-turns in the UK at high-volume intersections /junctions
    - Provide offset left-turn lanes or right-turn lanes in the UK at intersections /junctions
    - Improve lighting
    - Improve roadway delineation
    - Improve traffic control at work zones
- When crossing roads older pedestrians tend to have problems assessing complex traffic situations, and need more time to process information. The wider research evidence suggests that one of the most effective measures is reducing the width of crossing points and speed reduction. The use of on crossing detectors and additional countdown facilities can also be installed.

Action 2.2: Identify Locations that are Potentially Hazardous to Elderly Road Users in the Partner Cities

Introduction

The identification of potentially hazardous locations for elderly road users is a prerequisite for realising age-friendly road safety solutions. The process of selecting such locations is time-consuming and so is rarely done outside projects such as SaMERU. The knowledge created helps to prioritise the investment of resources for the benefit of the growing percentage of elderly road users. In SaMERU, the following four partners each selected five locations for further accident investigation:

- Modena
- Burgos
- Lancashire
- Southend-on-Sea

The selection of these locations was conducted by accident analyses. However, the detailed criteria varied slightly between partners. The reason for the variation is that local characteristics needed to be considered. In order to illustrate the general methodology, the procedure applied for Lancashire is given. In Lancashire five locations were selected as the most hazardous for older road users based on the following selection criteria:

- Step 1: Five-year accident injury search (2006-2010) for elderly road user casualties (aged 65+), for worst 500m road lengths having 5 or more personal injuries – produced 28 locations
- Step 2: The 28 locations were then subject to a ranking procedure based on a score of 2 for each KSI (killed or seriously injured) and 1 for each slight injury. Three locations scored 15, 14 & 12 with a further six locations scoring 9
- Step 3: The locations scoring 9, were then ranked according to the number of casualties with Tithebarn St, Preston scoring 8 and three locations scoring 7
- Step 4: Of the three locations scoring 7, two locations (both on Marine Road, Morecambe) were selected to be studied together due to their close proximity and combined total of 14 casualties aged 65 and over.

Similar steps were conducted in the other partner cities. The next steps included the detailed description of the accident location including photographs, the traffic flow and the accidents. For this report, only one example from Modena and one from Burgos were selected. All other locations together with the further analyses can be found in the partner reports in action 2.2.

Modena Hazardous Locations

Location: Vittorio Emanuele II Avenue is located a few yards away from the zebra crossing in Crispi Street and both stretches are connected by a roundabout and a cycle path.

Figure 5 – Modena Vittorio Emanuele II Avenue.

Traffic flows along Vittorio Emanuele II Avenue, which is the main access to the city. It may be used by pedestrians on both sides and by cyclists along the cycle path. Motor vehicles may access the parking area in Piazzale Roma, opposite the Accademia, since the city centre is a restricted access area.

Vittorio Emanuele II Avenue is a dual carriageway road, each carriageway having two lanes of 3.50 metre width. The carriageways are separated by a central reserve with crossing gates every 50-80 metre to accommodate pedestrian crossings and let vehicles turn towards the roads on the sides of the Avenue.

Figure 6 - Pictures of Location 1, part A.

Two-lane carriageway _ V.E.II Avenue

Central reserve gates Crossings

Gates of 2-3 metre width are provided within the central reserve, which are not intended as pedestrian crossings but are incorrectly used as such and consequently lead to high accident rates, as shown in the analyses conducted through City Trek (software).

Parking is permitted on the right hand side of both carriageways, both in parallel and at right angles to the kerb. Parking spaces are identified by vertical and horizontal markings and are subject to charges.

Figure 7 - Pictures of Location 1, part B.

Zebra crossing

Reserve gates with no signs

On the right hand side of the parking spaces there are two large pavements, with 4-5 metre sections and trees at the centre. Owing to the varying widths of the sections, they were laid out differently. The right hand side, towards the Accademia, is divided in two, the pavement near the parking spaces is used as a cycle path and the other half is reserved for pedestrians.

The cycle path has many hazards, including narrow passages, trees, very slippery grids protecting tree roots and mobile cycle stands which are often moved to the centre of the cycle path. The number of intersecting roads creates an additional hazard. Cyclists often use the carriageway or the pavement near the buildings, and zigzag among pedestrians.

The pavement leading to the Natale Bruni roundabout is reserved for pedestrians, and cyclists going in this direction are forced to use the carriageway.

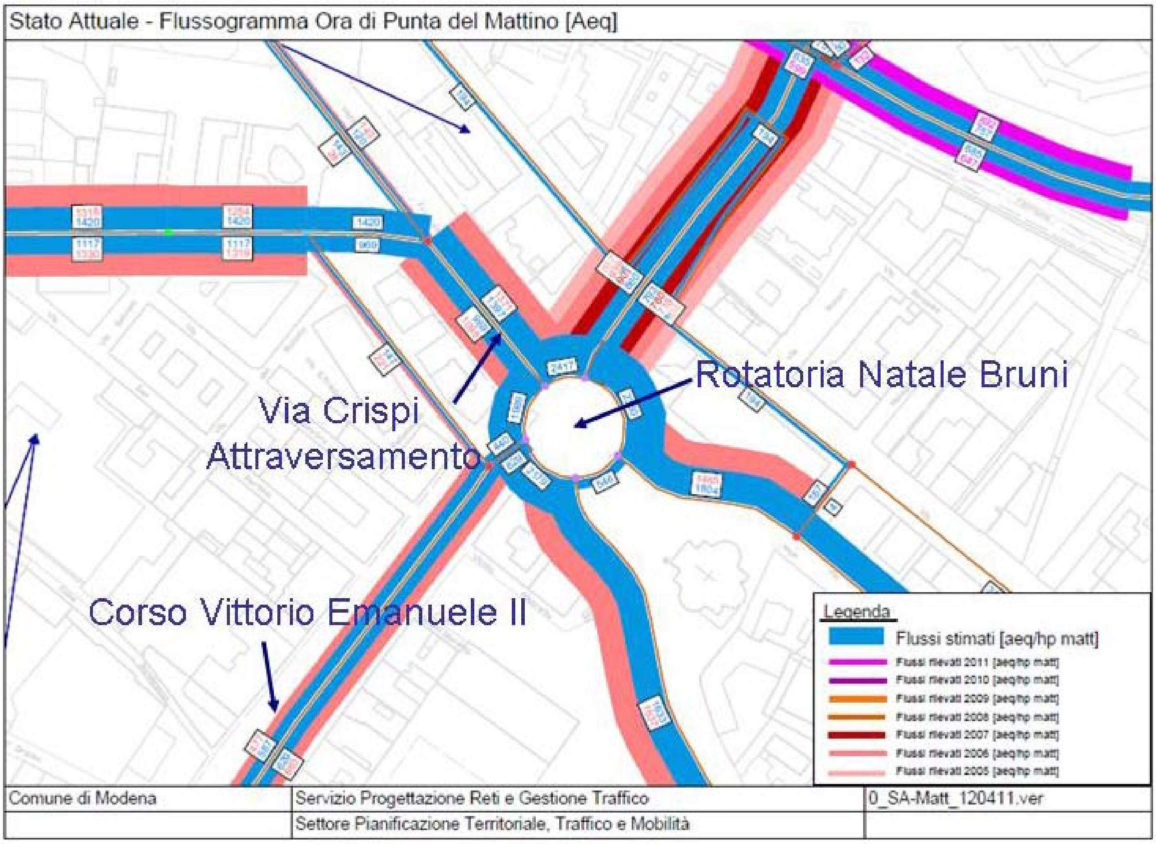
A survey showed that the majority of cyclists use the carriageway on the side where the cycle path is located. The survey confirmed that the zebra crossings were signed to prohibit their use by cyclists, who should cross by dismounting and pushing their bikes.

After dark, this road is well illuminated by street lighting positioned in the central reserve, which ensures good visibility of road junctions and zebra crossings.

Traffic volumes

Traffic volumes were calculated using the Simulation Model developed by means of the Visum software, so as to ascertain the number of vehicles actually circulating at junctions and along the main carriageway. This provided an accurate picture of the traffic flows, as shown in the diagram below:

Figure 8 - Traffic Flow Diagram, Modena



Traffic flows were surveyed during the morning from 7.30am and 8.30am; estimates were made if data was missing.

Accidents

A detailed analysis showed that between 2010 and 2011 accidents and injuries reported near the zebra crossing amounted to:

- 16 accidents;
- 17 injuries.

77% of the injured (14 out of 17) belonged to vulnerable groups such as pedestrians, cyclists and motorcyclists, with a 41% peak (7) of cyclists. An analysis of the accident rate and the width of the road shows that the accidents mostly involving cyclists took place near the 3-4 metre wide gaps in the central reserve, where cycling is prohibited.

Burgos Hazardous Locations

Location: Cantabria Avenue
In Burgos the accident analyses revealed the main zebra crossing at Cantabria Avenue to be a hazardous location. The combination of high volumes of cars and pedestrians was identified as a main reason for the high number of accidents. On one side, there is the University building (Polytechnics University of Burgos), and further on, two high schools, two professional schools, an elementary school and the School of Languages. It is therefore an area where schools and colleges are concentrated and is also a main pedestrian route through the city.

Accidents
Collisions occurred because pedestrians and cyclists were still crossing the road as vehicles were pulling away. An additional risk was the presence of parked cars adjacent to the 3-lane carriageway, which restricted the visibility of pedestrians who had started to cross.

Figure 9 - Example of Accident Location in Burgos.

The number of slight injury accidents was a concern. There were 20 in 2008 and 14 in 2009. These comprised students up to 18 (25% and 20%), students from 18 up to 25 (30% and 25%) and elderly people (30% and 20%). Although none of the accidents were fatal or severe the high number is still is a concern.

Measures Taken or Planned
Because of the many traffic accidents in Burgos, the City Council resolved to implement a number of accident reduction measures. These included improved traffic signing and road markings to make crossing the road safer for pedestrians and additional traffic signals positioned on high posts to reduce the risk of them being obscured by large vehicles.

Figure 10 - Example of Accident Location in Burgos.

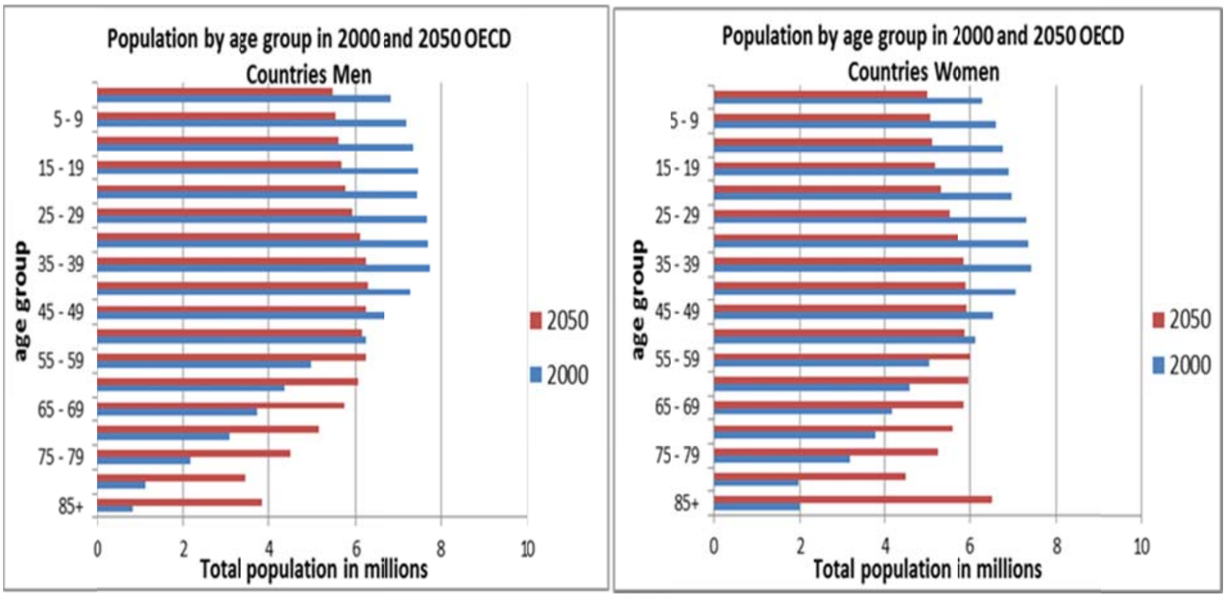
Countdown facilities were installed at signal controlled crossings. These assisted pedestrians by informing them when to cross and the crossing time remaining, which was especially helpful for elderly pedestrians.

Action 2.1, 2.4-2.5: Accident Statistics and Trends

Socio-demographic Data

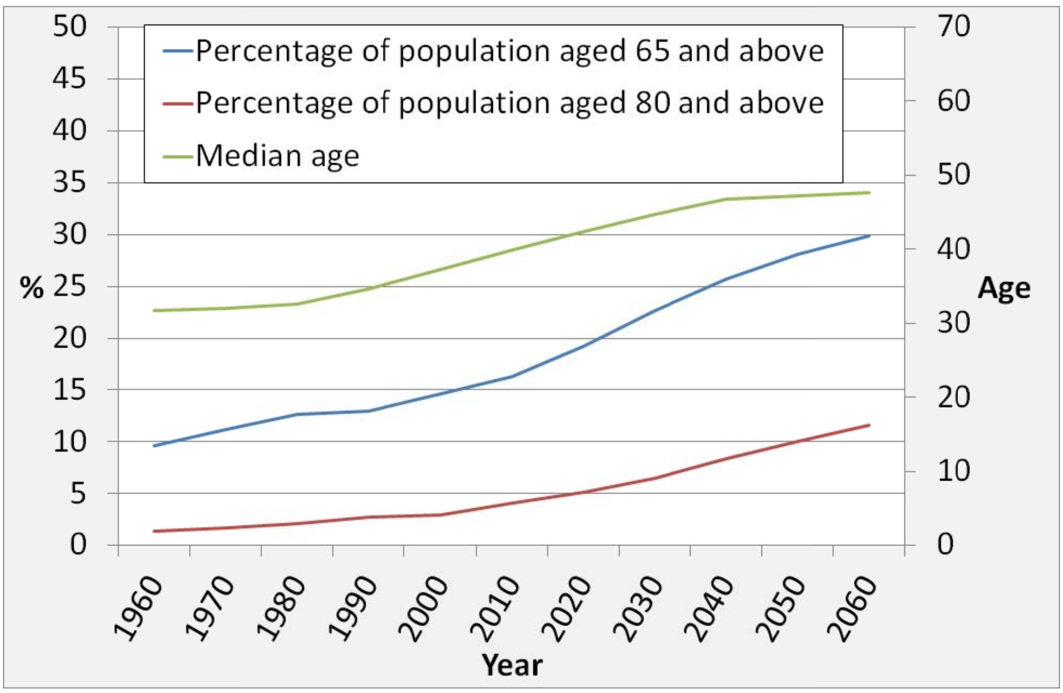
The population is ageing but at the same time mobility is increasing. The generations aged 65 and over are keeping their driving licences longer and are driving more kilometres than previous cohorts (Berry, 2011). Senior drivers (65+) represent the fastest growing part of the driving population in industrialised countries (Siren & Kjær, 2011). The OECD (2001a) estimate that a quarter of all drivers in 2030 will be aged 65 and above in Europe. In the OECD countries the proportion of older adults aged 80 and older will increase from 4% to 12% (OECD, 2001b). It is expected, that the age group 65+ will be the largest population in 2050. See Figure 21.

Figure 11: Demographic Development in the OECD countries in 2000 and 2050
(Calculation based on OECD, 2007).



In the EU the number of Europeans aged 80 plus will triple by the year 2060 (Eurostat, 2010). The proportion of people aged 80 and older will rise from 4% to 12%. The proportion of EU citizens aged 65 plus will increase over the same period from 17% to 30% (Lanzierie, 2011) (see Figure 12). It is estimated that by 2060, the proportion of the population aged 65 or older will be 22% in Ireland, 25% in the UK, Belgium and Denmark, 33% in Bulgaria, Germany and Slovakia, 35% in Romania and Poland, and 36% in Estonia (Lanzierie, 2011). The proportion of people aged 65 or older in EU member states is estimated to increase to between two and six times what it was in 1960.

Figure 12 - Projected Population change in Europe (EU-27). (Calculation based on Lanzierie (2011).



According to Eurostat (Lanzierie, 2011), the population of Germany will have dropped dramatically by 2030. In 2030 Germany will have the oldest population of any country in the EU with 46.2% of its population aged over 65. In contrast, the cities with the youngest median ages in 2030 will be London, Paris, Oslo, and Brussels (Lanzierie, 2011).

The City of Modena in Italy has 184,633 inhabitants as of 2010 and is located in Northern Italy. Over the five year period from 2006 to 2010 the population grew by 3% and the population aged over 65 years increased by 2%. 23% of the population is aged 65 years and over, which is higher than the Italian average of 20%. Data from the National Transport Department (2011) showed that 16% of active driving licences were held by people 65 years of age or over. The results of the questionnaire (see WP1 for more detail) showed that 23% of 65 to 74 year olds never drive a car, but for people between 75 to 90 years of age this percentage doubles to 51%.

The Borough of Southend-on-Sea in the UK has 174,274 residents as of 2011. Over the period 2006 to 2011 the population grew by 6% and the population aged over 65 years increased by 5%. 18% of the population is aged 65 years and over, which is higher than the England average of 16%. Lancashire in the UK has a population of 1,165,800 of which 18% (206,347) are over the age of 65.

Changes in the Number of Older Drivers and their Mobility

Drivers over the age of 65 are the fastest growing part of the driving population in industrialised countries (A. Siren & Kjær, 2011). This trend is even visible for short periods of time (Kalinowska, Kloas, & Kuhfeld, 2007) and is especially valid for older women (BMVBS, 2010). This development will continue in the future with projections for Europe suggesting that by 2030, a quarter of all drivers will be aged 65 and above (OECD, 2001b) (see Figure 13).

Figure 13 - Percentage of Licensed Drivers in Europe in the Age Group 65+ in 2000 and 2030 (European Commission Road Safety, 2001)

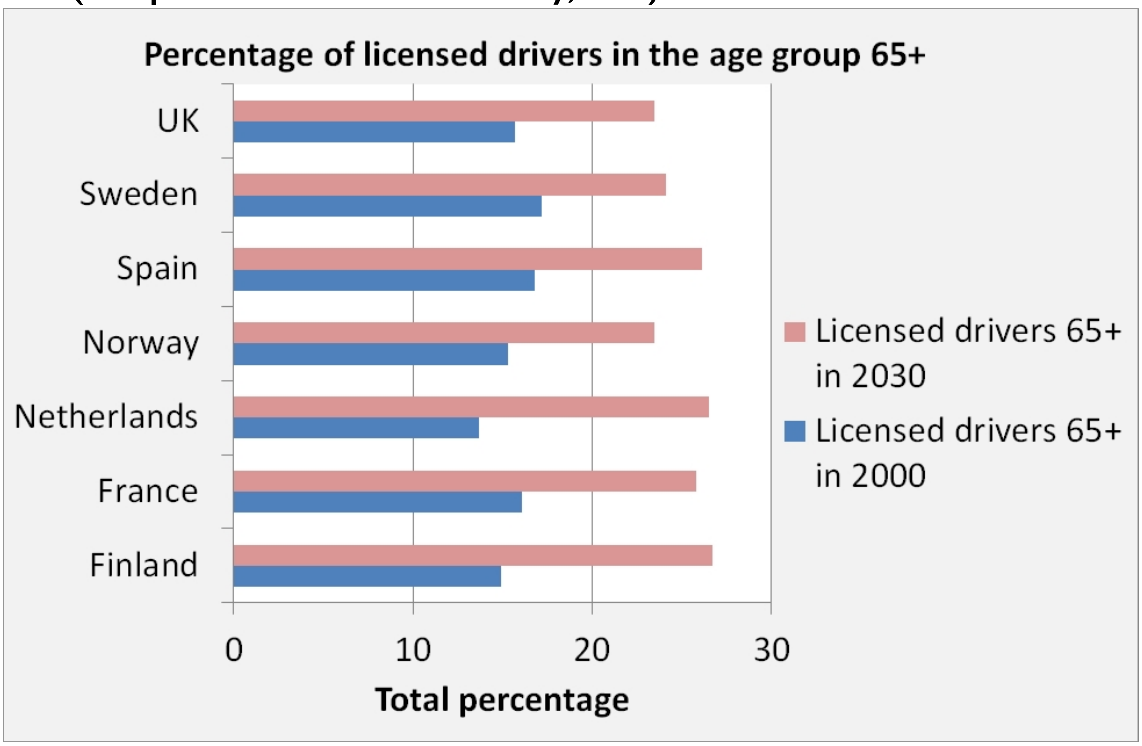
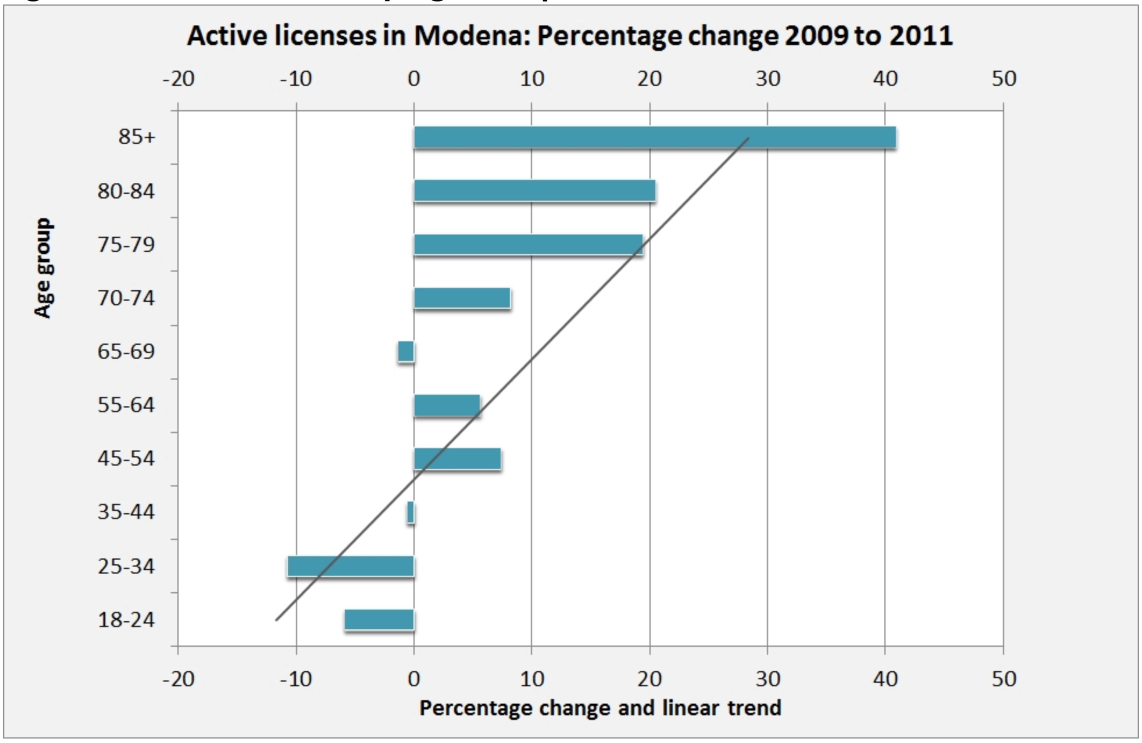


Figure 14 shows the percentage change of drivers per age group in Modena between 2009 and 2011. Whereas the number of drivers aged 85+ increased by nearly 40 percent, the figures for younger age groups actually declined. This general trend is also depicted in the linear trend line.

Figure 14: Active Licences by Age Group in the Province of Modena from 2009 to 2011



In Italy, licences have to be renewed according to set intervals, depending on the age of the driver (ranging from every ten years for drivers aged under 50 years up to every two years for drivers aged 80+) (see SaMERU report WP2.21, Modena). Therefore, the increase in the percentage of active driving licences for the older population means that these people actively renewed their licences and were regarded as fit to drive by a medical doctor. In this respect these changes might reflect a more realistic picture of active drivers than for countries that do not have a renewal policy.

Analyse Accident Statistics Summary

The four partner cities provided individual reports on accidents for a five year period in their cities. The reports have focussed on the causes of accidents and accident types involving road users over 65 years of age. Lancashire, Modena and Southend-on-Sea provided accident data for a five year period between 2006 and 2010, however Burgos provided data between 2009 and 2011 due to a change in the way accident data was collected and measured.

The table below shows the accident comparison for older road users between the four partner cities:

Table 6 - Older Road User Accident Data

	Burgos (2009-2011)	Lancashire (2006-2010)	Modena (2006-2010)	Southend (2006-2010)
Accident casualties over 65 years	101	2321	1009	278
Slight accidents	98*	1823	991*	223
Serious accidents		498		51
Fatalities	3	Included within serious accidents	18	4
Pedestrian	67	379	174	66
Cycle	n/a	75	301	19
Powered two wheeler	n/a	44	58	5
Car/taxi, driver, passenger	24	1566	455	150
Bus	4	Included in other	10	28
Other	3	257	11	10

* Modena and Burgos do not distinguish between slight and serious accidents, instead they monitor numbers injured.

Modena

Three police forces report accidents in Modena, however they all use the standardised form CTT/Inc to report accidents. The National Institute of Statistics (ISTAT) maintains the national road accident database for Italy.

Italy classifies accidents as injured or fatal. Fatalities are defined as the number of deceased people involved in the accident and also those that die after 30 days of the accident.

For the five year period from 2006 to 2010 the Modena report concluded that 7,223 accidents occurred, accounting for 9,616 casualties and 70 fatalities. Of these accidents, older people were involved in 21% of the total number of accidents and account for 991 injuries (11%) and 18 fatalities (26%).

Road accidents in Modena occur mainly in urban areas. Over the five year period a reduction for road users aged between 18 and 44 years has been observed, whereas the number of road users over 75 years of age has increased. Most older people in Modena are injured as a car driver followed by cyclist casualty totals and pedestrian casualties. Overall, 28% of pedestrian and 25% of cycle accidents involve the older population. These increases in accidents involving older people can be related to the increases in the older population.

71% of the accidents involving older people occur between 10:00 and 18:00. Modena's accident data did not show any considerable seasonal differences in accident numbers.

Southend-on-Sea
In the UK, information on injury road accidents is known as STATS19 and recorded under STATS20 guidelines. The severity of injury accidents is classified as fatal, serious or slight.

The Southend accident report concluded that for the 5-year period from January 2006 to December 2010, 17% of the total accidents in the Borough of Southend-on-Sea involved a person aged 65 years or older. This older road user was either involved as a vehicle occupant or injured as a pedestrian. The proportion of fatal or serious accidents involving older road users was 22%, which is higher than the equivalent proportion (17%) for all road users in the Borough. The highest risk group is pedestrians who represent half of all older road user killed or seriously injured casualties.

Most older road user accidents occur between 09:00 and 17:59 with a peak between 11:00 and 11:59. Older Road users are less likely to be involved in accidents at night – only 17% of their accidents occur during the hours of darkness which is less than the equivalent proportion of 26% for all road users. Fewer older road user accidents occur at the weekends. Most accidents involving older road users occur in July, October and November.

Total accidents involving older road users in Southend-on-Sea for the five-year period show a downward trend. However, the numbers of fatal and serious accidents involving older road users remains consistent.

In terms of road user group, most older road users are injured as car occupants, 150 (54.0%) casualties, than as pedestrians, 66 (23.7%) followed by bus passengers, 28 (10.1%) and pedal cyclists, 19 (6.8%). The numbers of casualties to older road users as motor cyclists and other road users are 15 (5.4%) between both groups. In terms of severity, 28 of the 55 (50.1%) older road users killed or seriously injured were pedestrians. In terms of the high severity representing the vulnerability, the older pedestrian is the highest risk group.

It is estimated that only 5% of all accidents in the study period involve an older road user at fault. For older road users at fault as a driver or rider, the two most common contributory factors are failed to look properly and failed to judge the other person's path or speed. For older pedestrians the top recorded contributory factor was failed to look properly.

Lancashire
Lancashire provided two accident reports, one which covers the 5 year period from 2006 to 2011 and an updated report that covers the 5 year period from 2007 to 2011.

The reports conclude that overall older casualty trends have not fully followed the downward movement for younger age-groups in the five-year periods covered. When comparing older people's percentage of the population with the percentage of casualties, the incidence of older casualties has remained lower than would be expected. The overall trend over the five years shows considerable variations between the twelve Districts in Lancashire. A greater percentage of older casualties are killed or seriously-injured, rather than slightly-injured, relative to younger casualties. The vast majority of older casualties occur in the middle 12 hours of the day from 0600 to 1759, a distribution not seen to the same extent in younger casualties.

Burgos
The Burgos accident report covers accident data for a period of two years from mid 2009 until mid 2011. Burgos has covered this different period of time compared to the other cities because during 2009 the way accident data was collected and measured was changed. The accident data shown has been provided by the Burgos Police.

There were 101 accidents that involved an older road user being injured and three of these were fatalities. 20% of the total accidents involved an older person, which is relatively low considering this age group accounts for 25% of the total population in Burgos.

60% of all accidents involving older people involve a car crash. The next highest accident type involves a knock down (18%) and of these older people are likely to get injured, as 68% of injury occur because of a knock down. The three fatalities that occurred to this age group were because of a knock down accident.

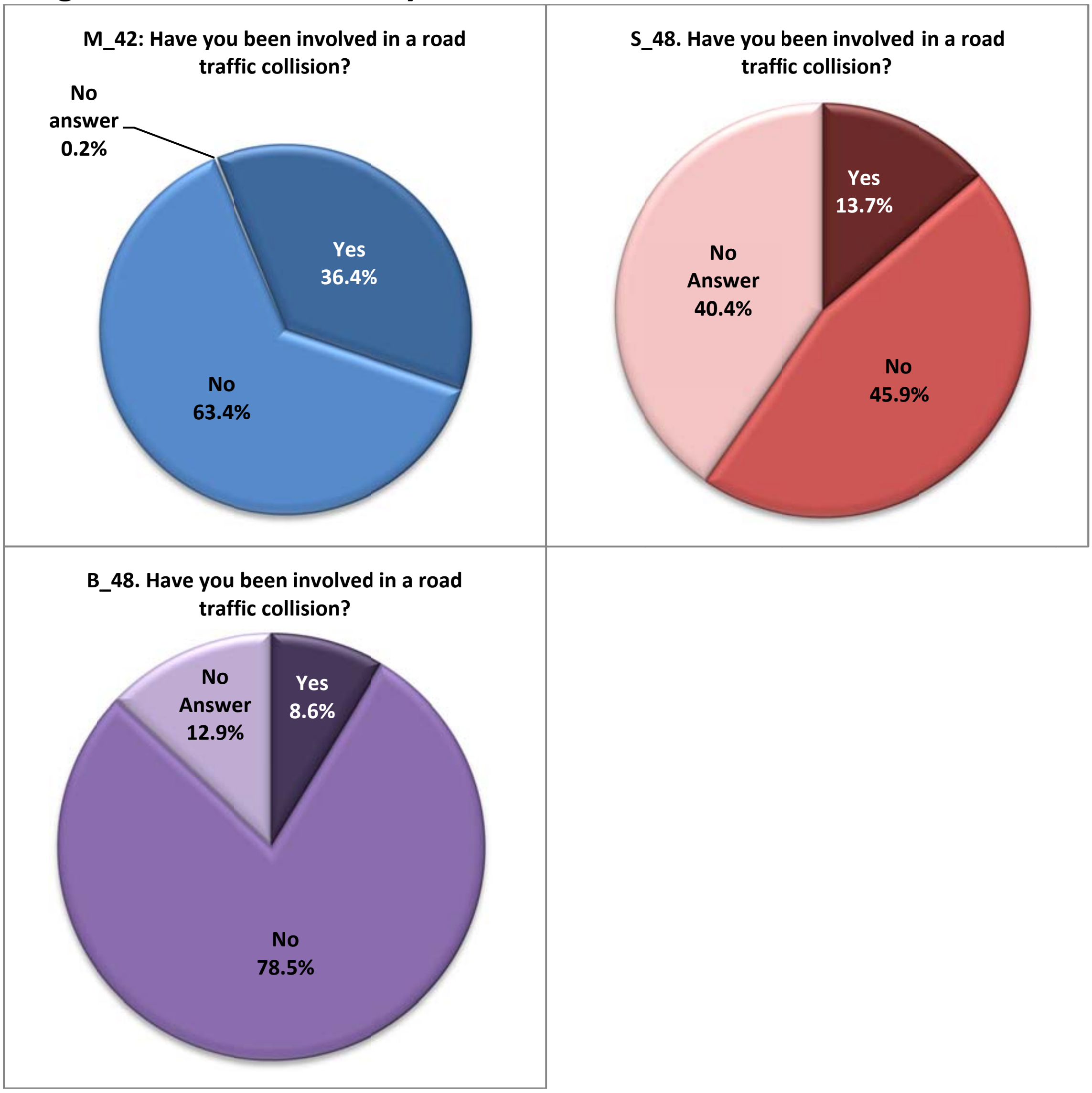
The Burgos report concludes that older people do not appear to be involved in more accidents than other age groups, however if older people are involved in an accident where they are knocked down then they are twice as likely to be seriously hurt. Burgos also recognises that the percentage of older people being injured in bus accidents is high.

Questionnaire
A questionnaire has been completed by a number of residents from three of the SaMERU project cities - Southend-on-Sea, Modena and Burgos. More details regarding the questionnaire and analysis are found under WP1 and on the SaMERU website.

Figure 15 shows the answers that were given by each of the three cities to the question that asked ‘As a motorist have you ever been involved in a road traffic collision?’

The majority of people in all three authorities answered that they have not been involved in a road traffic collision. The data shows that more people have been involved in a collision in Modena (36.4%) than in Southend-on-Sea (13.7%) or Burgos (8.6%).

Figure 15 – Residents Questionnaire Analysis for Modena, Southend-on-Sea and Burgos. As a Motorist have you Ever been Involved in a Road Traffic Collision?



Severity of Injury

A section of the SaMERU project has involved looking into the accident severity classifications used in the partner countries. Data collection systems of road accidents differ significantly across Europe. Lancashire County Council undertook accident investigation across Europe for WP4 and produced a report found on the SaMERU website. The detail of this report is found under Work Package 4 in this report.

Police data provides the primary source of data for road safety research and for accident circumstances and characteristics. There are also other data sources for accidents, such as the health sector. All the accident databases have their own purposes and each has some limits. The added value of health data has been reported by various studies (Amoros et al; 2007; Amoros et al; 2008; Chini et al; 2008; Rosman & Knuiman, 1994 and Tsui et al; 2009).

A further issue is the underreporting of road accidents by official police reports as illustrated by many studies indicating that the probability of reporting is influenced by severity, age and road user type (Amoros et al; 2006; Cryer et al; 2001; Elvik and Mysen; 1999; Hauer and Hakkert; 1988; Luijc Finch; 2008; Rosman et al; 2001; and Savolainen et al; 2011). Thus, health databases could be used to complement Police accident data, this would give the following extra information when reporting an accident:

- to analyse in-depth the health consequences of road accidents
- to better understand accident severity
- to estimate related health care costs
- to estimate under-reporting.

From this research work that Modena carried out, it is recommended that a data integration system should be used to provide systematic collection and interpretation of health consequences of road injuries.

Table 7 - The EUROSTAT (Eurostat, 2010) Defines Injury Severity as Follows:

	BVII ACCIDENTS
B.VII-02	Fatal accident Any injury accident resulting in a person killed.
B.VII-03	Non-fatal accident Any injury accident other than a fatal accident.
B.VII-04	Casualty Any person killed or injured as a result of an injury accident.
B.VII-05	Person killed Any person killed immediately or dying within 30 days as a result of an injury accident, excluding suicides.
B.VII-06	Person injured Any person who as result of an injury accident was not killed immediately or not dying within 30 days, but sustained an injury, normally needing medical treatment, excluding attempted suicides.
B.VII-07	Person seriously injured Any person injured who was hospitalized for a period of more than 24 hours.
B.VII-08	Person slightly injured Any person injured excluding persons killed or seriously injured. Persons with lesser wounds, such as minor cuts and bruises are not normally recorded as injured

Severity classifications vary across Europe which hampers data comparability of injury severity due to the various injury level (slight, serious) definitions applied. Table 7 reports the severity definition utilised in the partner countries. In all five partner countries the 30 days period to define a person killed due to a road accident is used.

Regarding injury severity, Italy differs from the other partners as it does not distinguish between serious and slight injuries. In the UK accident severity is categorised according the type of injury; slight accidents include minor tissue damage, while a fracture is considered as severe.

Classifying injury severity on the accident scene by police has its limits as they are non-medically trained. A more objective measure is based on hospitalisation. Many countries provide information on "serious" and "slight" injuries based on hospital stay. Among them Germany defines the severity level as serious if a person involved in an accident has been an in-patient at hospital for at least 24 hours, and France and Spain define the level as serious if a person is hospitalised for more than 24 hours. Consideration needs to be given that factors such as age and pre-existing conditions can lead to a longer hospitalisation period. Furthermore, other factors such as the health care delivery system or financial matters may have an influence on the length of hospital stay.

Table 8: Severity Classification in the Partner Countries

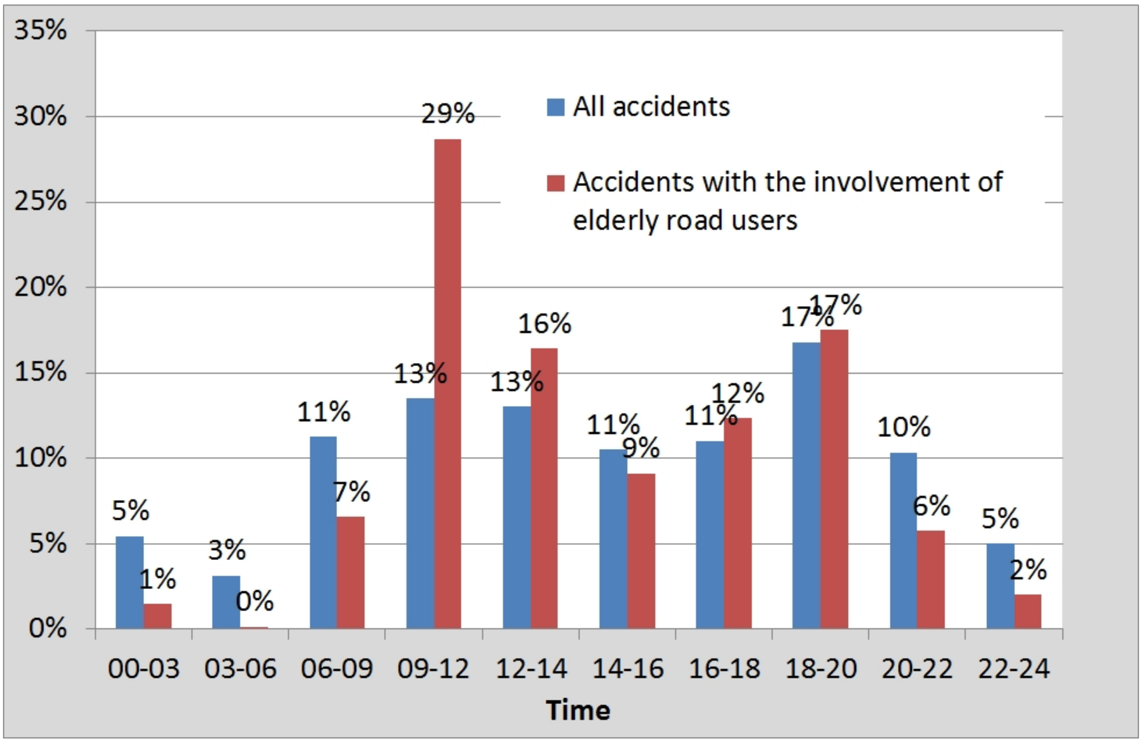
	UK	ITALY	SPAIN	GERMANY	FRANCE
Fatal injury definition	Within 30 days	Within 30 days	Within 30 days	Within 30 days	Within 30 days
Severity classification	Death Seriously injured Slightly injured	Death Injured	Death Seriously injuries Slightly injuries	Death Seriously injured Slightly injured	Death Seriously injured Slightly injured
Severity definition	Classification based on kind of injury	Binary division in killed and injured No classificatio n in serious and slight	Seriously injured defined as hospitalised for more than 24 hours	Seriously injured defined as a hospital stay of at least 24 hours	Seriously injured defined as hospitalised for more than 24 hours
Severity assessment	Based on judgement of police on scene /on spot assessment	Police report	Police Report	Based on assessment of police on scene	
Crosscheck with hospital data for fatalities	Yes, for persons died within 30 days	Yes, for persons died within 30 days	Yes, for persons died within 30 days	Yes, for persons died within 30 days	
Crosscheck with hospital for injury severity	Not systematically	No injury severity. City Police collects hospital of treatment and days of prognosis.	Not systematically	Yes, check with hospital data	

Source: Information reported by the partners

Time of Day/Night Collisions

When dealing with mobility patterns of older drivers, the first thing that comes to mind is the time of day they travel. One way to learn when older people travel is analysing the accident data. In order to do this the SaMERU partners compared the distribution of all accidents and of accidents involving at least one older person across 24 hours of a day.

Figure 16: Distribution of all Accidents and Accidents with Older Road Users by Time of the Day in Modena between 2005-2010



It is striking how similar both the data from Modena (see

Figure 16) and the data from Southend (see Figure 17) are. They both show a peak in accidents involving an older person between 9am. and noon. This period is outside the morning rush-hour indicating some adjustment in the daily routine of older people. Not surprising is the fact that hardly any accidents involving older people happen between midnight and 6am. These results for Modena and Southend are supported by the literature and other statistics.

However, when aggregated for night time, slight differences between both cities become visible. As can be seen in Figure 18, the percentage of night time accidents is, in general, higher for Southend where the percentage of accidents involving older people is also higher.

Figure 17: Distribution of all Accidents and Accidents with Older Road Users by Time of the Day in Southend between 2006-2010

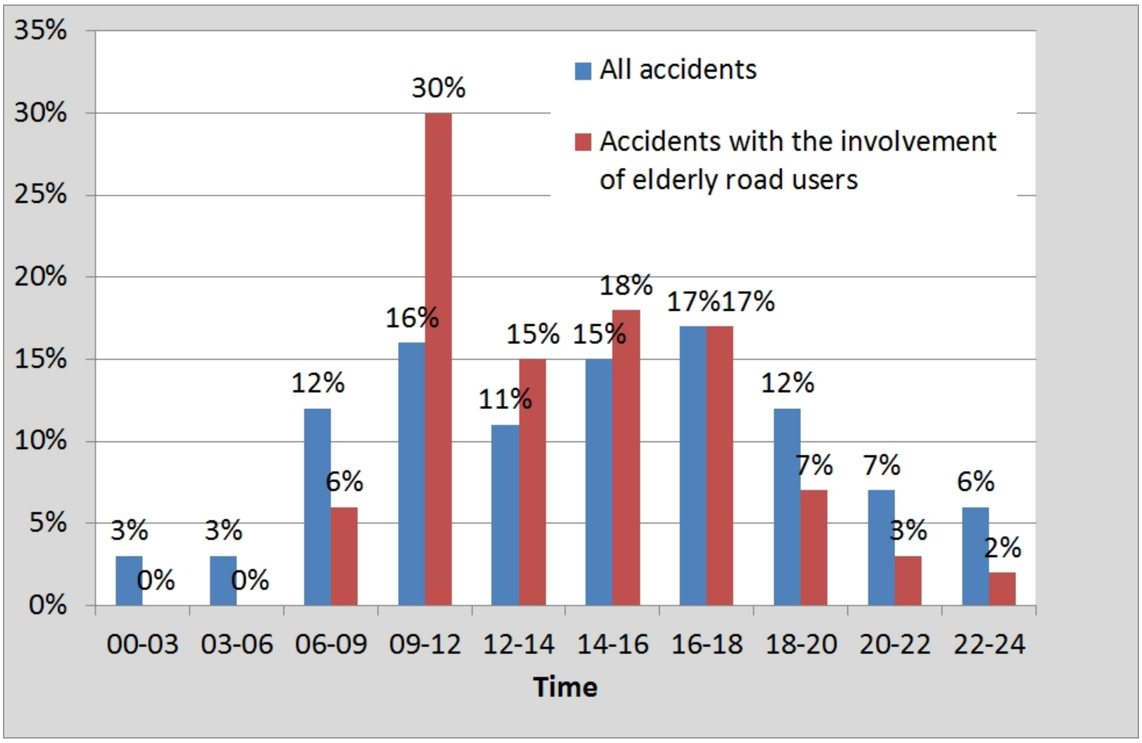
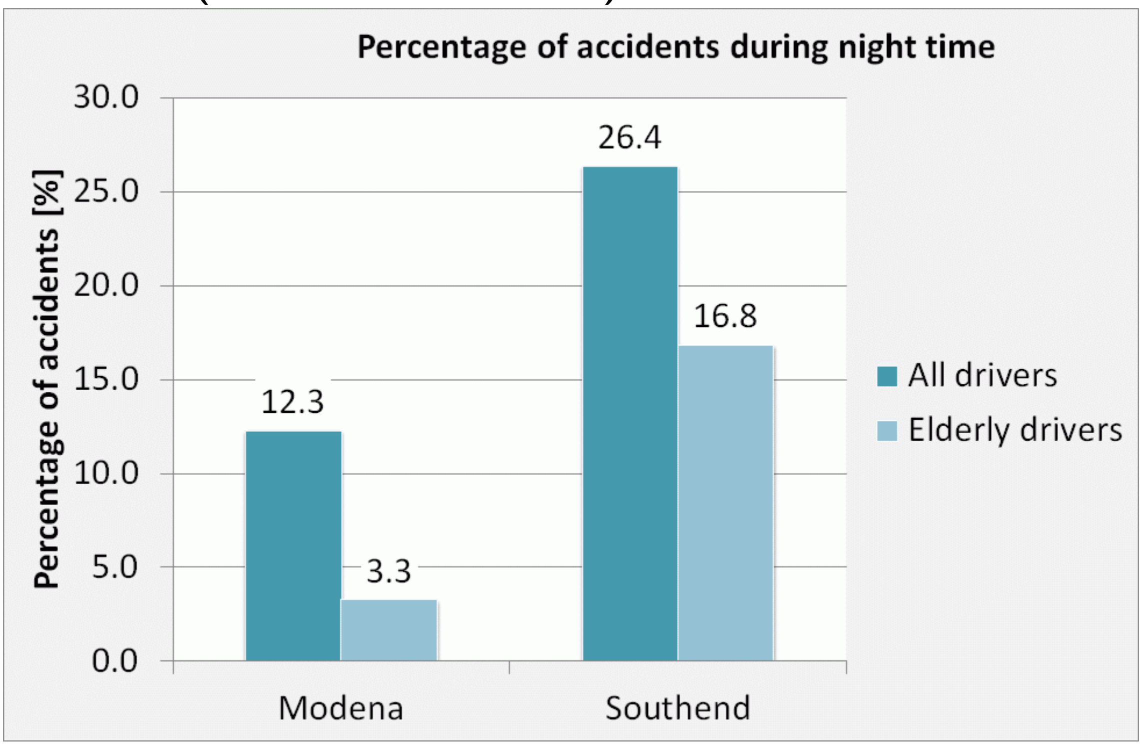


Figure 18: Percentage of Night Accidents of All Drivers and Older Drivers in Modena and Southend (Data between 2006 and 2010).



The picture becomes even more pronounced when fatalities, not accidents, are analysed. As can be seen in

Figure 19, there are no fatalities of older road users at all during the night whereas 29% of fatalities of under 65s occur during the night.

Figure 19: Fatalities During Night Time in Modena 206-2010

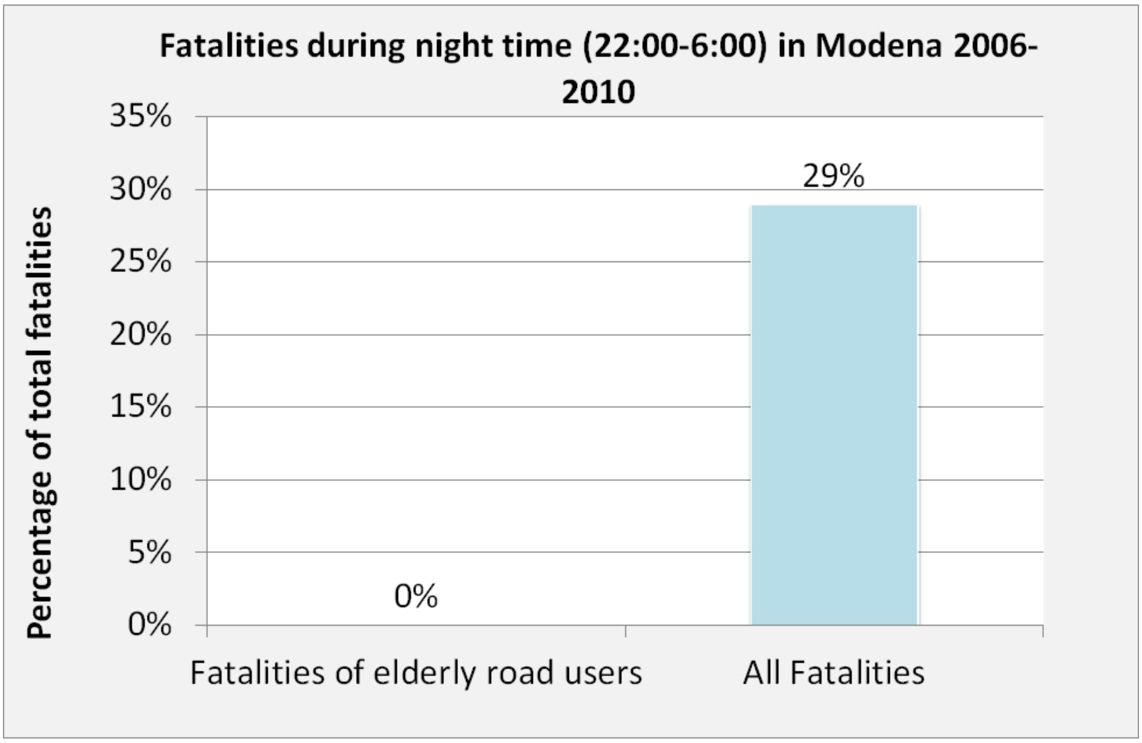
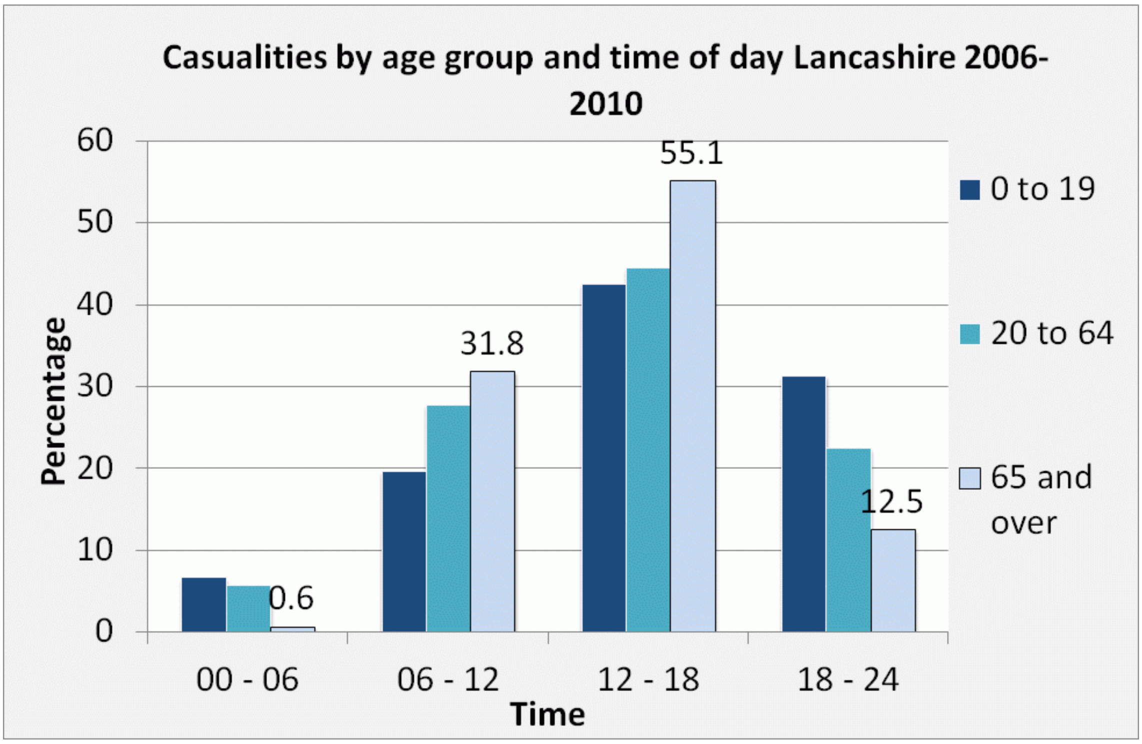


Figure 20: Casualities by Age Group and Time of the Day in Lancashire 2006-2010



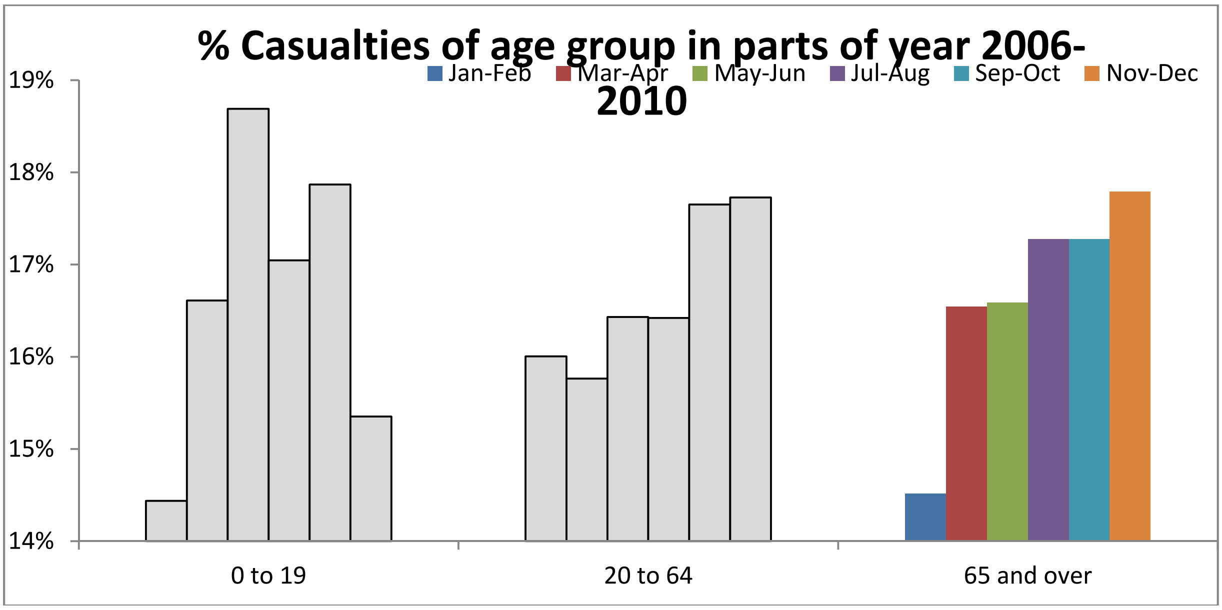
In Lancashire almost 87% of older casualties occurred in the 12-hour period after 06:00 a.m. with less than 1% in the 6-hour period before 06:00 a.m. (Figure 20). This pattern contrasts with the wider distribution over the day in the younger age groups.

Table 9 below shows the number of accidents by season for Southend and Modena. The accidents are relatively evenly distributed over the year however for accidents involving older people there are more during the winter months. In Figure 21, where calendar months are considered in consecutive pairs, November/December is, as with the 20 to 64 age group, the time of year in which the greatest number of older casualties occur. The upward movement from September/October to those last two months of the calendar year is considerably greater in the older age group.

Table 9 - Accidents by Season/Month for Southend and Modena 2006-2010

	Southend		**Modena**	
Season	Total (%)	Total 65+ (%)	Total (%)	Total 65+ (%)
Spring (March – May)	538 (23%)	96 (24%)	1709 (24%)	1356 (24%)
Summer (June - August)	526 (23%)	74 (19%)	1842 (26%)	1457 (25%)
Autumn (September - November)	647 (28%)	104 (27%)	1736 (24%)	1392 (24%)
Winter (December – February)	611 (26%)	118 (30%)	1936 (27%)	1526 (27%)
Total	**2322**	**392 (100%)**	**7,223**	**5,731 (100%)**

Figure 21 - Percentage of Casualties by Age Group in Lancashire (2006-2010)



Contributory Factors to Road Collisions

Certain contributory factors have been identified by the project partners and are listed below:

Road user illness/fatigue

- Fatigue
- Sudden indisposition
- Illness

Right of way violation collisions including right-turn (UK), left-turn (other EU countries):

- Not respecting stop or give way sign
- Right of way violation
- Irregular turn to the left
- Give way to pedestrian
- Manoeuvre to turn left (petrol station etc.)
- Traffic signal violation
- Right of way (pedestrian)

Excessive speed

- Excessive speed
- Exceeding speed limit

Alcohol /drug

- Alcohol related collision
- Drug related collision (illicit drugs)

Loss of control

- leaving the street without collision with other vehicles

Modena

Overall the selected factors account for 36% of the accidents and 38% of the fatalities (Table 10). As illustrated in Table 11, the most frequent contributory factor during the 5-year period was 'distracted driving or indecisive behaviour', this accounted for 43% of accidents, followed by disobeying stop or give way signs accounting for 18% of the accidents.

Table 12 reports the proportion of older people who have caused a collision and the contributory factors. The principle factor for older people causing a collision is a right of way violation. The second highest cause is a speed violation.

Table 10 - Number of Accidents, Injured and Fatalities of Selected Principal Causes, Modena 2006-2010

Principle causes	Accident	Injury	Death	% accident	%Injury	%Death
All principal causes	6336	8509	65	100%	100%	100%
Selected principal causes:	2311	3085	25	36%	36%	38%
• Right of way (driver)	**1717**	**2279**	**8**	**27%**	**27%**	**12%**
• Right of way (pedestrian)	**63**	**69**	**0**	**1%**	**1%**	
• Speed violation	**277**	**414**	**12**	**4%**	**5%**	**18%**
• Alcohol /drug	**103**	**152**	**0**	**2%**	**2%**	
• Fatigue/illness	**25**	**29**	3	**0.4%**	**0.3%**	**5%**
• Loss of control	**126**	**142**	**2**	**2%**	**2%**	**3%**

Table 11 - Accidents, Injured and Fatalities of Most Frequent Causes Modena 2006-2010

Principal causes	Accident	Injury	Death	% accident	%Injury	%Death
All principal causes	6336	8509	65	100%	100%	100%
Most frequent causes:	5168	7083	51	82%	83%	78%
Distracted driving, indecisive behaviour	**2695**	**3685**	**24**	**43%**	**43%**	**37%**
Disobey stop or give way sign	**1156**	**1551**	**3**	**18%**	**18%**	**3%**
Security distance	**386**	**592**	**2**	**6%**	**7%**	**3%**
Excessive speed	**271**	**409**	**11**	**4%**	**5%**	**17%**
Driving in wrong direction	**167**	**242**	**6**	**3%**	**3%**	**9%**

Table 12 - Principal Accident Factors Caused by Older and All Accidents, Modena 2006-2010

Principle causes	Accidents Older at fault	All accidents
Right of way (driver)	**89 (5%)**	**1717 (100%)**

Right of way (pedestrian)	16 (25%)	**63 (100%)**
Speed violation	**25 (9%)**	**277 (100%)**
Alcohol /drug	**4 (4%)**	**103 (100%)**
Fatigue/illness	14 (58%)	**25 (100%)**
Loss of control	**7 (6%)**	**126 (100%)**
Total selected causes	155 (7%)	2311 (100%)

Southend-on-Sea

Since 2005 in the UK, a new set of national contributory factors have been collected by police forces. An officer may assign up to six factors per accident in order of importance. The factor is generally associated with a vehicle or a casualty together with a confidence level (very likely or possible). Furthermore, the same factor can appear more than once in an accident for different vehicles or casualties.

In most cases, the reporting officer notes vehicle one as the offending vehicle. However, it should be noted that in cases where a pedestrian and only one vehicle was involved, the driver/rider is not necessarily at fault.

There were 201 accidents in Southend-on-Sea involving an older driver/rider at fault. This represents 8.6% of all 2322 accidents in the study period.

Table 13 shows the selected accident types identified by contributory factors. The percentages are calculated for the 201 accidents in which an older road user was at fault for driver/rider factors. There were 65 accidents in which an older road user was injured as a pedestrian and this total is used for percentages of pedestrian factors.

Table 13 – Accidents for Older Road User/Driver at Fault by Contributory Factors for Southend-on-Sea

Accident Type	Accidents	% Percentage
Illness/Fatigue (Driver/Rider)	10	5.0
Illness/Fatigue (Pedestrian)	4	7.6
Right of Way Violation (Driver/Rider)	21	10.4
Right of Way Violation (Pedestrian)	4	4.6
Alcohol/Drugs (Driver/Rider)	2	1.0
Alcohol/Drugs (Pedestrian)	2	3.1
Excessive Speed/Loss of Control	24	11.9

Table 14 below shows the number of accidents based on the top five contributory factors for accidents involving older people in Southend-on-Sea. The top two recorded contributory factors for older drivers/riders are failed to look properly and failed to judge the other person's path or speed. For older pedestrians the top recorded contributory factor was failed to look properly.

Table 14 - Number of Accidents Based on the Top Five Contributory Factors Codes

Accident Type	Accidents	% Percentage
Failed to look properly (driver/rider)	81	40.3
Failed to judge other person's path or speed (driver/rider)	44	21.9
Careless/Reckless/in a hurry (driver/rider)	31	15.4
Failed to look properly (pedestrian)	22	33.8
Poor manoeuvre or turn (driver/rider)	25	12.4

Actions 2.6-2.8: Pedestrian Accidents

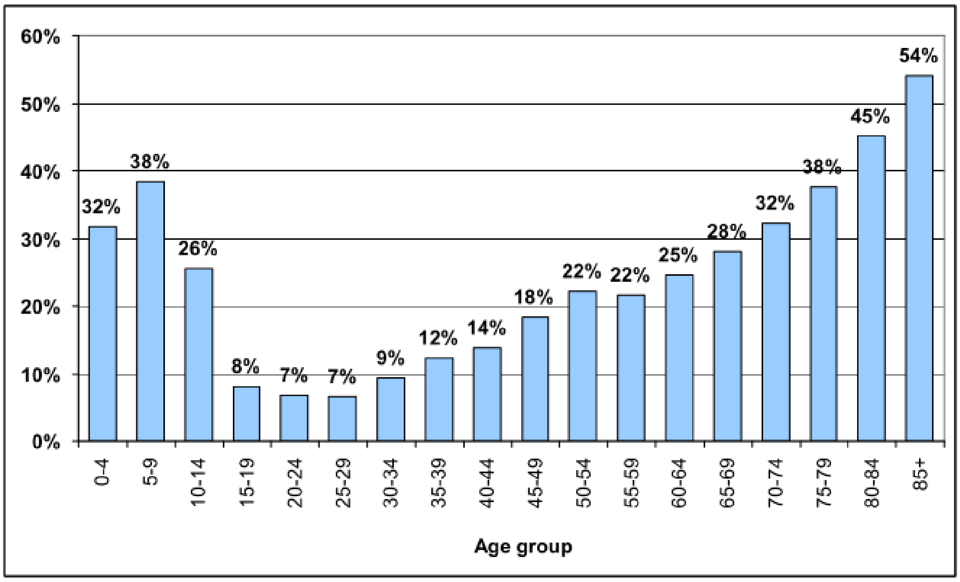
Older pedestrians are a vulnerable road user group. In Italy, Greece and France, more than half of all pedestrian fatalities involve older people (SafetyNet, 2009). In France in 2006, 51% of pedestrians killed on the road were over 65 years old and this age group represents less than 15% of the population (ONISR, 2010). In contrast, people over 65 years of age account for a third of fatalities in the United Kingdom and Ireland (UNECE, 2011). Table 15 shows the statistics of pedestrian fatalities in several European countries in 2005 and 2008. The percentages of older pedestrians killed are particularly high in western and southern Europe and lower in northern and eastern Europe.

Figure 22 shows the pedestrian fatalities by age group and highlights the over-representation of older pedestrians among these fatalities. The older pedestrians are clearly a high-risk compared to other age groups. This risk increases with ageing: 28% for the 65-69 years old but 54% for the 85 years and older.

Table 15 - Summary of European statistics regarding pedestrian fatalities of older adults (64 years and over) in 2005 and 2008 (data issue from UNECE, 2011)

	2005		*2008*	
Countries	*65 years and over killed*	*Total of pedestrians killed*	*65 years and over killed*	*Total of pedestrians killed*
NORTHERN EUROPE				
Denmark	18 (41%)	44	23 (40%)	58
Finland	20 (44%)	45	28 (53%)	53
Ireland	20 (28%)	72	12 (25%)	49
Sweden	22 (44%)	50	19 (42%)	45
United Kingdom	250 (36%)	699	216 (36%)	591
Means	*330 (39%)*	*910*	*298 (39%)*	*796*
WESTERN EUROPE				
Austria	43 (44%)	97	58 (57%)	102
Belgium	54 (50%)	108	34 (34%)	99
France	325 (51%)	635	266 (48%)	548
Germany	336 (49%)	686	324 (50%)	653
Netherland	38 (46%)	83	22 (39%)	56
Means	*796 (48%)*	*1609*	*704 (46%)*	*1458*
SOUTHERN EUROPE				
Greece	126 (54%)	234	142 (57%)	248
Italy	425 (54%)	786	368 (57%)	648
Portugal	87 (41%)	214	66 (43%)	155
Spain	287 (42%)	680	212 (42%)	502
Means	*925 (48%)*	*1914*	*788 (50%)*	*1553*
EASTERN EUROPE				
Czech Republic	101 (34%)	298	84 (35%)	238
Estonia	11 (22%)	50	17 (42%)	41
Hungary	90 (31%)	289	92 (37%)	251
Poland	512 (29%)	1756	550 (29%)	1882
Romania	329 (34%)	978	378 (35%)	1065
Slovakia	46 (26%)	174	45 (22%)	204
Slovenia	18 (49%)	37	18 (46%)	39
Means	*1107 (32%)*	*3582*	*1184 (35%)*	*3720*

Figure 22 - Pedestrian Fatalities as a Percentage of Total Road Fatalities by Age Group in 19 Countries in Europe in 2006 (Papadimitriu et al, 2011)



The high percentage of older people is in part explained by the fact that pedestrian activity is more frequent in this population. Indeed, the pedestrian fatalities per million increases dramatically during ageing (see Figure 23). The fatality risk of pedestrians of 70-74 years is twice the average, whereas the fatality risk of pedestrians of 85 years and older is about four times the average (Papadimitriu et al, 2011).

Figure 23. Pedestrian Fatalities per Million Inhabitants by Age Group in 19 Countries in Europe in 2006 (Papadimitriu et al, 2011)

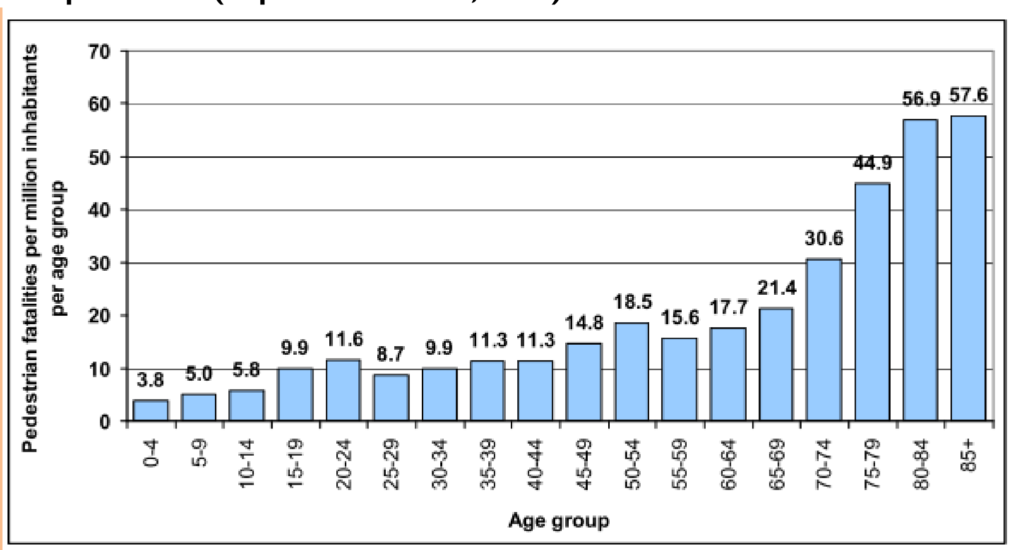


Table 16 shows the pedestrian accidents involving older road users in each of the partner cities. In Modena 28% of pedestrian accidents involve older people. In Southend 50% of older road users killed or seriously injured were pedestrians and it was also found that for the older pedestrian the most recorded contributory factor was failed to look properly. In Burgos, 70% of the total pedestrian knock downs involved older people. Lancashire also found that pedestrian accidents involving older people were higher.

Table 16 – Pedestrian accident numbers in the Partner Cities

	Burgos (2009-2011)	Lancashire (2006-2010)	Modena (2006-2010)	Southend (2006-2010)
Pedestrian	67	379	174	66

Southend-on-Sea Borough Council and Lancashire County Council carried out a joint piece of work on Action WP2.7, 'The effectiveness of highway improvement schemes in reducing the risk of accidents to older pedestrians'. Although action WP2.7 shall be covered under WP3 the findings from the report which relate to pedestrians are included below.

Lancashire and Southend-on-Sea analysis of pedestrian casualties for over 65 year olds show that two thirds were women and half were over the age of 80. Almost all pedestrian casualty accidents occurred between 9am and 6pm in daylight. Many were at or near junctions and most were crossing the road, but not at a formal pedestrian crossing. Evidence from the questionnaire results shows that older pedestrians have many 'trips and falls' on the pavement however these do not get reported or recorded.

Of those crossing a road a third collided with a vehicle which was either reversing, doing a U-turn, or driving the wrong way down a one way street. 19% were in a collision with a vehicle which was turning. These are manoeuvres more difficult to anticipate, particularly for older people who are more likely to have restricted head movements, greater difficulty assessing complex traffic situations and to need more time to process information. Since 2005 in the UK, accident records have included 'contributory factors', and the main factors were, carelessness and failure to look properly (mainly drivers) and failure to judge vehicle path or speed correctly (mainly pedestrians).

A survey of older pedestrians involved in accidents (Sheppard and Pattinson, 1986) provides some further understanding of the findings from the analysis of older pedestrian casualties in Lancashire and Southend-on-Sea. More of these older people had difficulty with eyesight or hearing than with mobility, emphasising that it is important to consider the impact of these less 'obvious' impairments on older people's ability to negotiate the traffic environment safely. Visual impairments will not only make crossing the road more difficult, but will also make it more difficult to use the pavements without tripping or falling, particularly if they are uneven. Many of these pedestrians had been in a collision with a vehicle which was doing something unusual, supporting the findings in Lancashire in particular, that U-turns, reversing and wrong way driving were factors in several of the accidents. Older people avoided using formal crossing points if it meant going out of their way; walking difficulties are likely to have influenced these decisions. These were also the conclusions of a study of the road safety of older people in Northern Ireland which found that older pedestrians think that controlled facilities do not allow enough crossing time and that only 57% of older people feel safe as pedestrians (Atkins 2012).

Actions 2.9- 2.12: Risk Factors and Vulnerable Older Pedestrians

The risk of unsafe street-crossing during ageing is increased by physical, sensorial, and cognitive declines that occur during ageing (Dommes & Cavallo, 2011) (see Reports 1.6, 1.7, 1.8).

Exogenous risk factors such as the traffic situation may impair the older pedestrians safety too. The complexity of road environments places high demands on older pedestrians. The two-way roads increase the risk of accidents in the older population (Fontaine & Gourlet, 1997; Oxley, Fildes, Ihsen, Charlton, & Day, 1997). Older pedestrians have a larger risk than other pedestrians to have an accident at intersections (particularly those without traffic signals) or to be struck by a turning vehicle (SafetyNet, 2009). The high speed of the approaching car is also an important risk factor because older pedestrians have difficulties in evaluating the speed of vehicles (Lobjois & Cavallo, 2007, 2009).

The risk to have an accident in which no moving vehicle is involved (e.g. falls on footpaths or when stepping off kerbs) increases during ageing too. The injuries that occur with this type of accident are generally less severe than the injuries that occur with accidents involving a moving vehicle (SafetyNet, 2009). Sadly, pedestrian accidents in which no moving vehicle is involved are under-reported in accident databases. In the United States, 77.5% of older pedestrian injuries are due to falls, whereas 15% are linked to being hit by a motor vehicle (Naumann, Dellinger, Haileysus, & Ryan, 2010).

The oldest pedestrians (over 80 years old) are more at risk than other older pedestrians (Dunbar et al., 2004). Functional declines are more common and more severe in the oldest pedestrians and increase the risk of accidents.

The gender and age of the older adults also predict the risk of making an unsafe street crossing decision. With increasing age, older women make more unsafe crossing decisions and become poorer at estimating their walking speed. By contrast, age was not a major factor in predicting unsafe crossing decisions in men. Thus, the crossing decisions of women are safer than the crossing decisions of men in younger adults but the reverse is true for older adults (Holland & Hill, 2010). The driving experience seems to reduce the risky crossing choices in older women: women with a driving license have larger safety margins than women without a driving license (Holland & Hill, 2010).

Recently, a Danish study (Bernhoft & Cartensen, 2008) revealed that older pedestrians like the pedestrian crossings, routes with sidewalks and signalled intersections more than younger pedestrians (people aged 40-49). A smooth surface on the sidewalk is also an important point for the older pedestrians. This could be explained by the fear of a fall. However, a higher proportion of older pedestrians cross the road where they are, in order to avoid a detour. This seems particularly true for older pedestrians with bad health.

Several facts suggest that older pedestrian women have more cautious behaviours than older pedestrian men (Bernhoft & Cartensen, 2008). A higher proportion of older men than women would choose the fastest route when walking and accord less importance to the presence of signalised crossings. Moreover, more older women than men will never walk against red lights and always walk up to a crossing if they can see one.

Data suggests that older male pedestrians are at a higher risk of collision than older females (Dunbar et al., 2004). It is important to keep in mind that more women than men compose the older population. In consequence, the absolute number of casualties is greater for women over 60 than for men in several countries. However, the investigation of casualties per population reveals a higher risk for men than women (see Dunbar et al., 2004). The difference between men and women is reduced by ageing (i.e. over 80 years vs. 60-79 years).

The older pedestrians who use walkers or canes for mobility are more vulnerable due to their slower walking speed than the other older pedestrians (Arango & Montufar, 2008). In the older population that does not use assistive devices, older men walk faster than older women. However, there are no gender differences in walking speed when pedestrians use walkers or canes for mobility (Arango & Montufar, 2008).

SRA (2013) carried out a review of evidence on the effectiveness of engineering countermeasures aimed at reducing pedestrian casualties (not specifically among older people) and considered countermeasures in four groups (Retting et al, 1996), which provide a useful framework:

- Speed reduction and speed management - Traffic calming measures such as narrowing roads, extending kerbs and widening footpaths can also be used to create a safer and more welcoming environment for pedestrians.
- Separating pedestrians and vehicles in time - Pedestrian only signal phase, early release signal timing, installation of traffic signals, automatic pedestrian detection, and in-pavement flashing lights warning drivers when pedestrians are present. PUFFIN crossings are widely used to provide pedestrians with a crossing time which is adapted to their speed of walking. The SaMERU research found that older people want to see a display indicating a countdown on how much time there is left to cross, and also the use of on crossing detectors.
- Separating pedestrians and vehicles in space - Retting et al's evidence shows that refuge islands are especially helpful to pedestrians who walk at slower speeds. Martin's (2006) evidence suggest that positioning formal crossing points to coincide with pedestrian desire lines and raising crossings so that drivers have to slow down to approach them are measures identified which influence pedestrian safety. An inexpensive intervention at signal-controlled junctions is to reposition stop lines further back from the crossing, making drivers stop further back, giving pedestrians more space and at the same time making them easier to see.
- Increasing the visibility of pedestrians - Retting et al's review of countermeasures for pedestrians of all ages identified parking restrictions as an effective measure. Removing on street parking is one approach. The introduction of diagonal parking where possible, directs pedestrians into the road at an angle which requires them to look in the direction of the traffic. Diagonal parking has been shown to reduce numbers of pedestrians entering the roadway in front of a parked vehicle. Careful positioning of bus stops in relation to junctions can increase visibility of pedestrians by decreasing the number of people entering the road in front of a stopped bus.
- Quality of pavements - height of steps, slope of ramps, kerb height, pavement width, and maintenance of pavements. A summary of research on the safety of older road users suggests that older pedestrians may have different visual search patterns to younger pedestrians and tend to spend a greater amount of time looking down in order to better place their feet to avoid falls. (Road Safety Committee, Parliament of Victoria, 2003). A further implication is that while spending more time looking down, older people will also be less able to monitor the traffic, and more prone to be taken by surprise or fail to see vehicles when crossing the road. Evidence from the United

States, New Zealand, and Great Britain suggests approximately one third of those aged over 65 fall each year (Rowe, 2000).

IFSTTAR (2012) undertook research regarding older pedestrians, cyclists and bus users. The pedestrian section of the report is summarised below.

Several pedestrian safety measures have been reviewed by Papadimitriou et al (2011), which specified the four major actions listed below. These actions are similar to that found in Lancashire and Southend-on-Sea's research.

- Management of vehicle traffic - Traffic restrictions, lorry ban, closure of side streets, one-way roads. Reduction of the speed to include traffic calming schemes Older pedestrian safety could also be improved by intersections less complex and by providing crossing facilities adapted to older pedestrians needs (Oxley et al., 2004).
- Provision or improvement of pedestrian infrastructures - To re-allocate urban space in favour of pedestrians. To propose an integrated walking network with sidewalks, zebra crossing, push-button signalised crossings, etc. Avoid abrupt level changes and use pedestrian-friendly walking surface is also important.
- Improving road user perception - Improve the visibility of pedestrians and vehicles to one another (e.g., fluorescent clothing for pedestrians, removal of visual obstacles, improvement of the street lighting). To make road marking and signing more visible and comprehensible is also necessary.
- Education and enforcement - To improve road user behaviour and raise awareness on the importance of safe behaviour.

Cyclist Accidents

The numbers of accidents that occurred in the partner cities involving older cyclists is shown below. Lancashire found that older cyclist accident numbers slightly reduced as the population aged, this could be due to people over the age of 65 cycling less than when they were young. Southend found that accidents involving older cyclists were quite high and accounted for 7% of all accidents. Modena also reported that a high number (25%) of cyclist casualties were older people.

Table 17 – Cyclist Accident Numbers in the Partner Cities

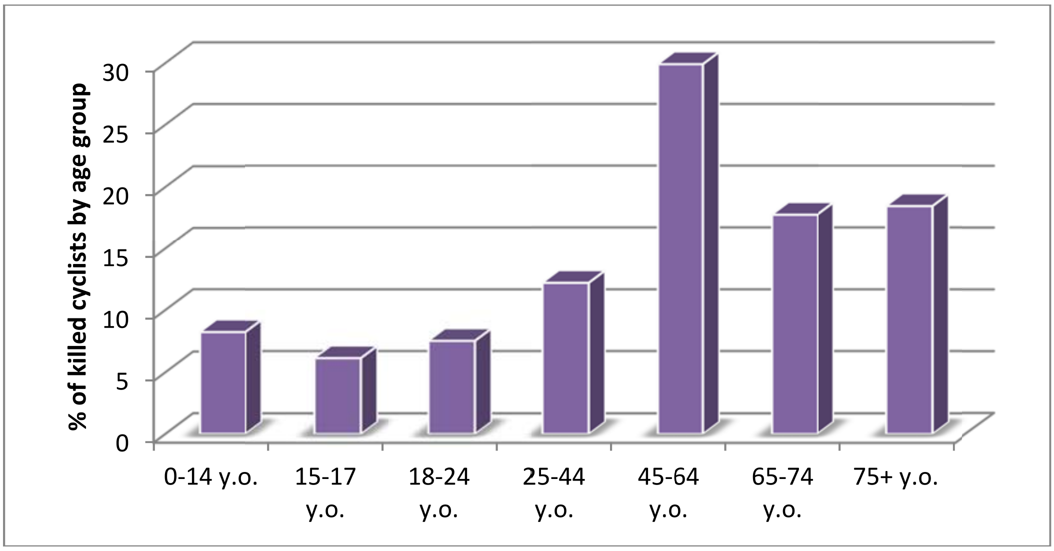
	Burgos (2009-2011)	Lancashire (2006-2010)	Modena (2006-2010)	Southend (2006-2010)
Cycle	n/a	75	301	19

Resarch by IFSTTAR (2012) found that cycling is a common mode of transportation in many countries and older adults use bicycles too. A large part of bicycle injuries or fatalities involves adults over 65 years old. Data on cyclist deaths in 2001 within the OECD-countries (IRTAD, 2007 in Scheiman, Moghaddas, Björnstig, Bylund, & Saveman, 2010) reveal that in Germany 635 cyclists were killed and 265 of these were 65 years and older. The ratio was 195/76 in the Netherlands, 56/24 in Denmark, 610/183 in Poland, and 141/43 in the Czech Republic.

Among the 1843 German older citizens (65 years and older) involved in traffic accidents between 1985 and 1998, 1,260 have been injured. Of the injured older road users, 27.4% were cyclists and among them 57.4% had serious or severe injuries (Richter, Pape, Otte, & Christian, 2005). In the Swedish population, the risk for the older cyclist is about 3 times

higher than that of the average cyclist, and the risk for members of the age group 75-84 is six times higher (Swedish National Road Administration, 1998 in Ekman, Welander, Svanström, Schelp, & Santesson, 2001).
In France, a large percentage of older cyclists have been killed in 2010 (see Figure 24), 65 years and older represented 36.1% of the killed cyclists.

Figure 24 Percentages of Killed Cyclists in 2010 in France by Age Group (ONISR, 2010)



Risk Factors and Vulnerable Older Cyclists
Swedish older men have a higher risk of injury than Swedish older women and have longer care periods than women (Ekman et al., 2001). As explained by Ekman et al. (2001), older men use cycles to cover twice the distance cycled by older women and older women are more disposed than older men to wear a bicycle helmet. These observations may explain the gender difference.

The study of Bernhoft and Carstensen (2008) gives more information about the preferences and behaviours of older cyclists. Both young and older cyclists appreciate the presence of cycle paths and are reassured by them. The presence of cycle paths and low traffic are important criteria for older cyclists when they have to make route choices. The fact that the route is the most direct or fastest is not an essential criterion. Moreover, older cyclists seem have more cautious behaviours than younger cyclists. Nearly 100% of the older cyclists declare never cycling against red lights (against 75% of the younger cyclists) and 80% never cycle in the opposite direction. Another interesting difference between older and younger cyclists concerns the stopping the bicycle before turning left or right in the UK. Both age groups most often stop but the older (notably the women) more often than the younger. The reasons evoked are that stopping makes them feel safer and get a better view. Older cyclists seem aware of the fact that turning left is a dangerous manoeuver for them: Danish national accident records reveal that older cyclists are overrepresented in accidents with the other party coming from behind (see Bernhoft and Carstensen, 2008).

Head injuries and injuries to the extremities dominate the non-fatal injuries whereas head and brain injuries are common causes of death among cyclists in all ages (Scheiman et al., 2010). Few older cyclists use a helmet. In consequence, a more frequent use of cycle helmets may reduce the amount of injuries among older cyclists. Information, education campaigns, or laws may be employed to increase helmet use (Schaiman et al., 2010).

Women have more injuries than men whilst getting on and off the bicycle (Scheiman et al., 2010). This kind of accident is relatively frequent and causes a large number of fractures or dislocations (e.g., hip and femur fractures). A preventative strategy may be to favour cycle models that are easier to get on and control. Major problems are related to seat height, forward-leaning position and overly high step-through. Another possibility is to develop education programs aimed at senior riders (Hayes et al., 2003 in Scheiman et al., 2010). Men have more injuries than women due to collisions with motor vehicles. Educational programmes that emphasise safe behaviours may also be interesting.

Several falls are due to poor road surface quality (e.g. irregularities in the surface, ice and snow on the road, gravels). In consequence, the good maintenance of road surface is essential. Moreover, older cyclists acclaim the presence of cycle paths and signalised crossings (Bernhoft and Carstensen, 2008). In consequence, it is important to develop this type of infrastructures. Indeed, older cyclists have difficulties to perceive when a gap is sufficient to join the traffic. Other infrastructure adjustments could help to improve the safety of cyclists such as special cycle turn lanes leading directly to intersections or separate cycle traffic signals with advance green lights for cyclists (Pucher & Dijkstra, 2003).

Bus Passenger Casualties

The numbers of accidents that occurred in the partner cities involving older bus passengers is shown in Table 18. The bus passenger accidents are low for Burgos and Modena being under the accident rates of pedestrians and cyclists, however for Southend the bus passenger accident numbers for older people are higher. In Southend 10% of older road users are involved in an accident as a bus passenger.

Table 18 – Bus Accident Numbers in the Partner Cities

	Burgos (2009-2011)	**Lancashire (2006-2010)**	**Modena (2006-2010)**	**Southend (2006-2010)**
Bus	4	Included in other	10	28
Other	3	257	11	10

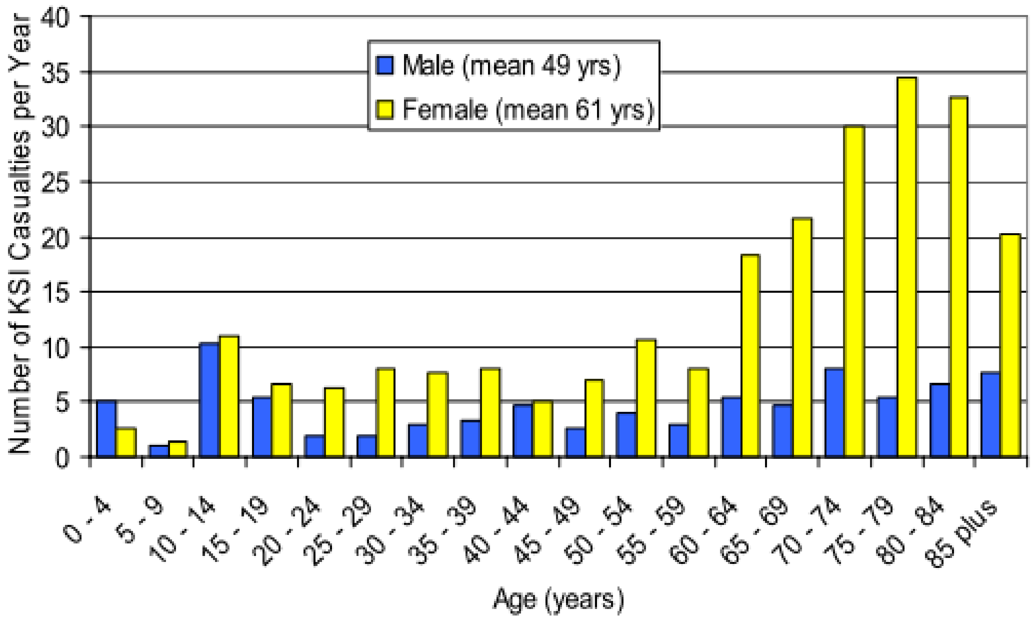
Bus travel is one of the safest modes of transportation and some improvements (e.g. low floor access) have allowed less mobile older adults to make use of bus travel. However, other improvements are still necessary to increase the safety of older bus users (Kirk et al., 2001). Albertsson and Falkmer (2005) performed a literature analysis of bus and coach incidents in Europe. Of all traffic fatalities in Europe, bus and coach fatalities represented only 0.3-0.5%. Fatalities were more frequent on rural roads (higher speed) but a vast majority of casualties occurred on urban roads and in dry weather conditions (more traffic and more passengers).

Risk Factors and Vulnerable Older Bus Users

Older people are disproportionately represented in non-collision bus injuries (i.e. injuries that occur while travelling on a bus without the bus itself being involved in a collision). A retrospective case reviewed the 62 non-collision incidents recorded in one year in the UK (Canavan, Gallagher, O'Dowd, Plunkett, & O'Neil, 2005). Adults over 65 years old represented 43% of these incidents. Accidents occurred notably during boarding and alighting. A large amount of casualties is also due to emergency braking (Albertsson & Falkmer, 2005).

Older women are overrepresented in bus casualties. Kirk et al. (2001) investigated the passenger casualties in non-collision incidents on buses and coaches in Great Britain. The data (see Figure 25) revealed that there are almost three times as many women as men among the killed or seriously injured passengers. This increase is most prevalent after the age of 70 and could be explained by the fact that older women use more buses than older men and have a lower tolerance to injury. Indeed, in Great Britain, local bus travels are more frequent among people aged 17-20 and 60 and older. Women aged 60 and older tend to make approximately 80-100 journeys per year (DETR, 2000 in Albertsson & Falkmer, 2005).

Figure 25. Killed or Seriously Injured Passengers on Buses or Coaches in Great Britain (per year, average 1999 to 2001) by Age and Gender (issue from Kirk et al., 2001)



The use of restraint systems has been proposed to reduce the risk and gravity of injuries in buses and coaches. The 2-point belt is cheap and easy to install but less efficient than the 3-point belt (Albertsson & Falkmer, 2005). However, the use of a safety belt is more useful to prevent damages during collision than non-collision accidents. Moreover, some older adults could be reluctant to use them and be afraid by difficulties to unhook the seat belt.

Several risks of falls and possible solutions have been reviewed by Kirk et al. (2011). Slips, trips and falls on the bus could be caused by slippery or uneven floors, unexpected or high steps, lack of visual clues, bad weather conditions, etc. In consequence, it is important that modern buses have clean and textured floor surfaces which give a good grip. Any steps or floor obstructions on the vehicle should be marked to act as visual cues. Uneven floors are to be avoided or slopes should not exceed 3 degrees inside the vehicle and 5 degrees around the door area. Slips, trips and falls could also occur whilst boarding and alighting. They could be caused by a too high step to the kerb, riser steps of different heights, etc. It is necessary to have a small step to the kerb and avoid differences in kerb heights at bus stops. Due to timetable constraints buses often start to accelerate away before passengers have the time to reach a seat or find a place to stand safely and hold on. This is particularly problematic for older adults which need more time to reach a seat. Giving more time before accelerating away or accelerating and braking more smoothly may help to reduce the risks. Priority seats, usually located near the front of the bus, are another solution. All bus customers are expected to yield priority seats to seniors or people with disabilities.

Action 2.13-2.14: Motorcyclist Accidents

In Southend and Lancashire the number of motorcyclist accidents involving older road users was low and accounted for 2%. Table 19 shows for the numbers of motorcyclist accidents involving older road users.

Table 19 – Pedestrian accident numbers in the Partner Cities

	Burgos (2009-2011)	Lancashire (2006-2010)	Modena (2006-2010)	Southend (2006-2010)
Powered two wheeler	n/a	44	58	5

There is a lack of data from Burgos as the local police do not register data regarding accidents involving people over 65 years of age using a motorcycle. This is expected as only 0.4% of the modal split accounts for motorcyclists over 65 years of age. The questionnaire that all the partner cities completed shows that the few people that are over 65 years of age and use a motorcycle only use one occasionally and for leisure, not for commuting.

Modena was able to provide more data. During the five year period from 2006 to 2010, 1,769 motorcyclists were killed or seriously injured in an accident, of these 83% were males. 88% of the motorcyclist accidents involved males. Only 3% of motorcyclists that get injured in an accident are over 65 years of age in Modena. This is relatively low considering that the population for 65 year olds and over is high in Modena.

Modena undertook a survey on motorcyclists and safety that included all age groups. The survey suggested that 98% of the respondents use a safety helmet, therefore it can be assumed that almost 100% of over 65 year olds use a helmet. 12% of respondents stated they would drive a car or a motorbike after having drunk 2 alcoholic units. As the survey included respondents of all ages for both cars and motorcycles this is not representative of motorcyclists over 65 years of age.

SaMERU research suggested there are no motorcyclist clubs, training, activities or promotions aimed directly at older people, all the promotions are found to focus on all age groups and mainly focus on safety. General safety advice includes, advising not to ride a motorcycle in bad weather or cautions about long distance motorcycle trips. Spain also warns about crash barriers which can be dangerous to motorcyclists.

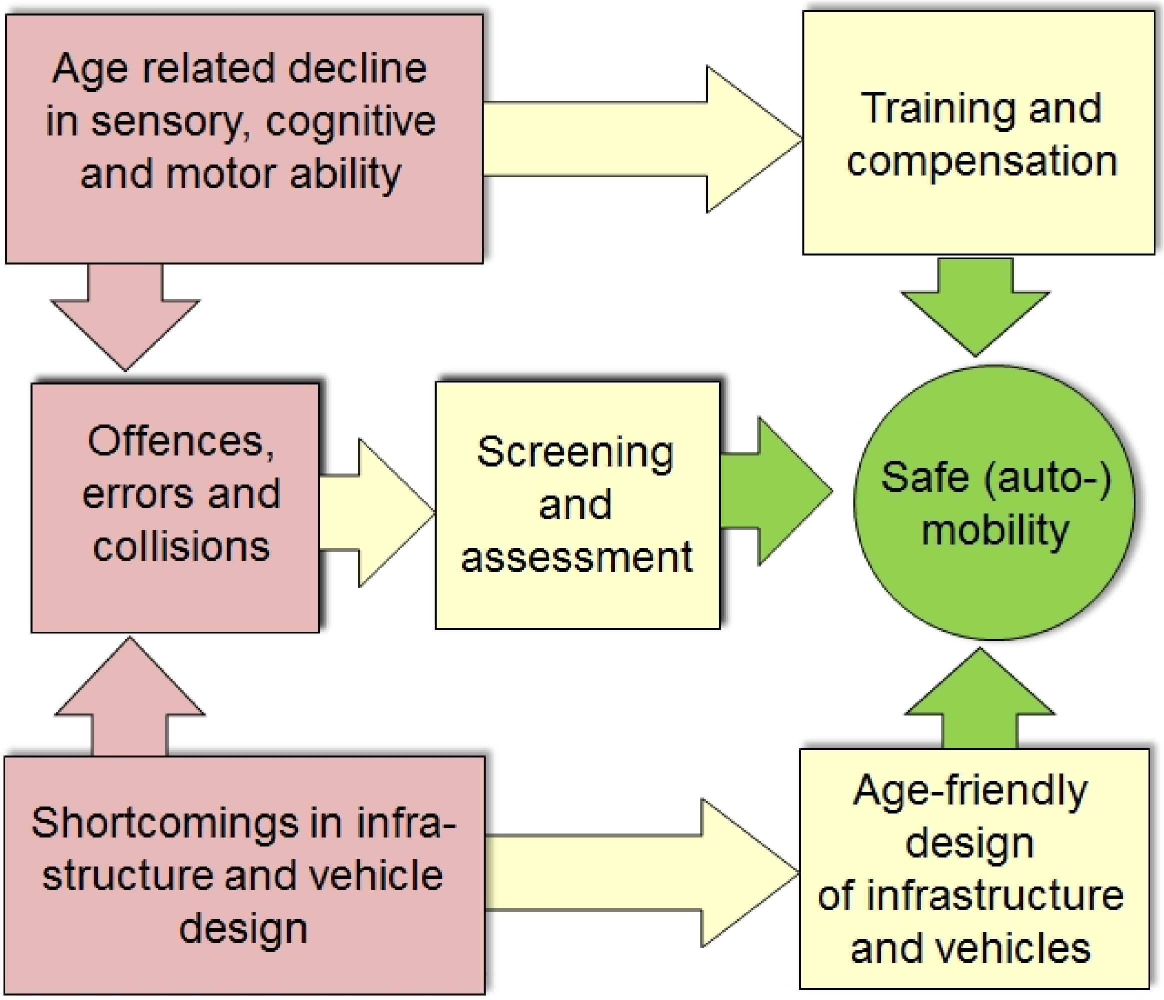
Actions 2.15-2.18: Driver Accidents

There has been a high increase in older people driving cars during the last few years and therefore there is a necessity to satisfy these mobility needs in a safe way. For driving, three ways of coping with age related declines can be distinguished (see Figure 26):

- Training and compensation as suggested in the model of selective optimisation with compensation suggested by Baltes & Baltes (1990).

- Designing the infrastructure, the vehicles and other means of transportation in an age-friendly way.
- Screening and assessment. This can serve as basis for training and compensation and must ultimately be accompanied by providing alternatives to driving in case the outcome suggests giving up driving.

Figure 26: Three Ways to Ensure Safe Mobility in Old Age.



In addition, compensation by the older drivers themselves must not be forgotten. A summary of potential compensatory measures by older drivers are given in Simoes (2003). The measures are discussed in the following:

Practical training is often conducted on a closed test track and usually includes some kind of driving dynamic training. An example of such training was conducted in the SaMERU project in Modena and is described in the respective SaMERU report. A list of such generic driver training and education programs can be found in Ford (2009). Usually, theoretical and practical training is combined.

Figure 27 - Driving Training with Older Drivers in Lancashire (Source: Lancashire presentation March 2012 in Modena)

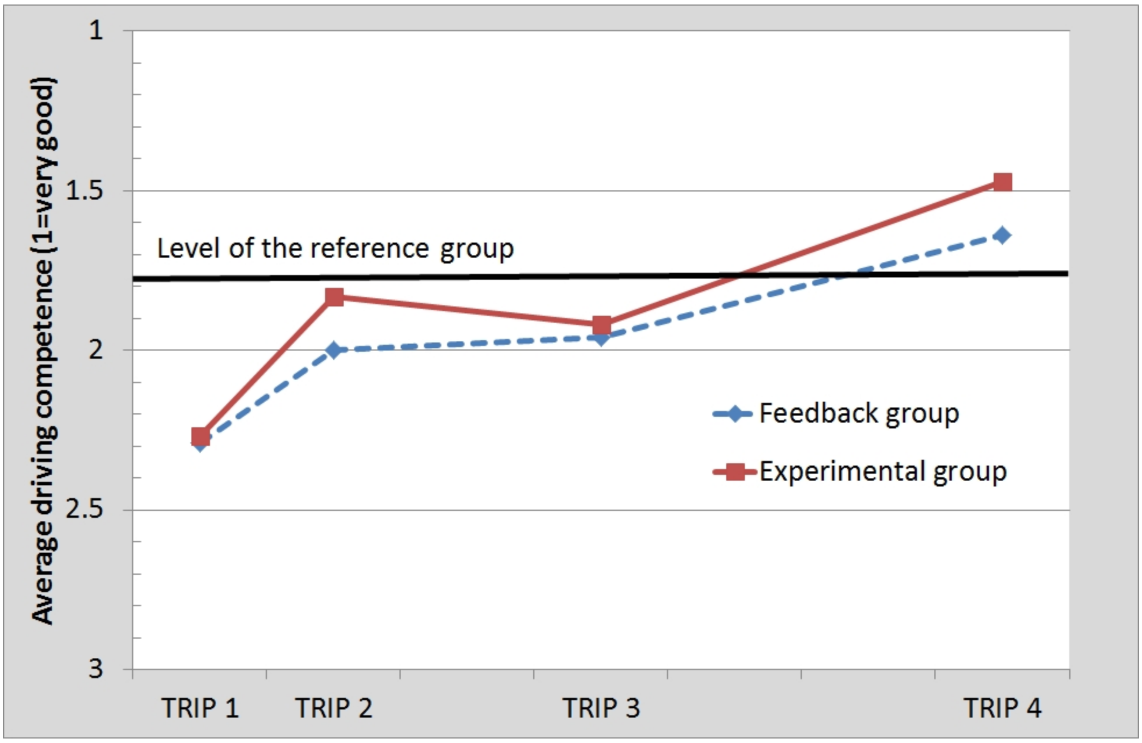
The positive effects of training are described in Poschadel, Boenke, Blöbaum, & Rabczinski (2012) (see figure 28) which concludes with the following:

- Driver training is a successful means to improve the driving quality and safety of older drivers.
- Simple feedback on driving errors and driving quality helps to improve the driving quality.
- Although simple feedback is successful on average, even better results can be obtained by tailor-made driving lessons.
- When only the worst drivers within each group are looked at, it is only the tailor-made driving lessons that resulted in a beneficial improvement.

Other authors share this positive evaluation of training for older drivers (Nichols, Rogers & Fisk, 2006; Romoser & Fisher, 2009). The effectiveness of training for older drivers helps to improve a number of factors including the following:

- Increases consciousness and knowledge regarding general and individual driving related limitations (Eby, Molnar, Shope, Vivoda & Fordyce, 2003; Marottoli et al., 2007; Owsley, Stalvey & Phillips, 2003).
- Improve driving performance.
- Improve safety although the relationship between training and accidents is difficult to prove (Nasvadi & Vavrik, 2007; Owsley et al., 2003).
- Cost-effective and have a high acceptance in society.

Figure 28: Effect of Training on Driving Competence (Poschadel et al., 2012)



Another group of measures are engineering measures regarding infrastructure and vehicle design. A summary of infrastructure-measures are given in Potts et al. (2004):

1. Provide advance warning signs
2. Provide advance guide signs and street name signs
3. Increase size and letter height of roadway signs
4. Provide all-red clearance intervals at signalised intersections
5. Provide more protected left-turn (right turn in the UK) signal phases at high-volume intersections
6. Provide offset left-turn (right turn in the UK) lanes at intersections
7. Improve lighting at intersections, horizontal curves, and railroad grade crossings
8. Improve roadway delineation
9. Replace painted channelisation with raised channelisation
10. Reduce intersection skew angle
11. Improve traffic control at work zones

When having to decide which measure to implement first, practitioners might find it helpful to know what other experts say regarding the general effectiveness of a given measure. Such expert-ratings were collected from Northern America and Europe by Schmidt (2004). The results are shown in Table 20.

Table 20: Ratings of the Effectiveness of Road-related Measures to Improve the Safety of Older Road Users (Schmidt, 2004) (N=48; 1=very effective to 5=not at all effective)

No.	"How effective is the measure to increase the safety of older drivers?"	M	DE/AT/CH	US/CA
1	Simplifying traffic information	1.70	1.73	1.60
2	Implementing protected left-turns at traffic lights	1.75	1.96	1.48
3	Implementing traffic lights	1.81	1.88	1.70
4	Standardising traffic organisation and signage especially at dangerous locations	1.91	2.04	1.70
5	Setting off the lane for turning left at intersections	1.95	2.18	1.61
6	Increasing the minimum reaction time for road planning to 2.5s	2.09	2.38	1.78
7	Installing street lighting at dangerous locations and motorway entrance ramps	2.15	2.23	2.00
8	Simplifying intersection designs	2.16	2.32	2.00
9	Installing particularly large and light intensive signal lamps	2.17	2.44	1.86
10	Treating median and island curb sides and curb horizontal surfaces with retroreflective markings	2.18	2.46	1.80
11	Implementing self-explaining roads	2.20	2.09	2.25
12	Reducing speed at intersections and urban roads (except for through roads)	2.21	2.24	2.24
13	Implementing particularly large and conspicuous traffic signs	2.24	2.54	1.80
14	Designing intersections with angles between 75° and 90°	2.30	2.40	2.12
15	Providing guidance by using raised channelisation with sloping curbed medians	2.35	2.75	1.81
16	Installing warning signs or lights for turning right WHEN RED	2.47	2.67	2.20
17	Installing roundabouts	2.48	2.08	3.06
18	Installing redundant signage	2.63	3.13	2.05
19	No turning right WHEN RED at intersections with angles less than 75°	2.74	3.05	2.35
20	Implementing a minimum receiving lane width of 3.6m	2.98	3.12	2.79
	Note: DE = Germany, AT = Austria; CH = Switzerland; US = USA, CA = Canada			

One of the measures always named with a high priority is protected left turns or right turns in the UK (see Figure 29).

Figure 29: Example of a Protected Left-Turn Regulation with Separate Green Phases for Turning Left Versus Going Straight

Vehicle based measures must be distinguished in two categories, design measures and measures based on new technology. An overview of vehicle design measures is given in Table 21.

Table 21: Functional Limitations and Relevant Design Principles for an Age-Friendly Control-Panel Design (based on Caird et al., 1998; Gardner-Bonneau & Gosbee, 1997, cited in SWOV, 2010)

Functional Limitations	Relevant Design Principles
General sensory deficits	Use redundant cues, like auditory, visual and tactile feedback
Visual acuity (close by)	Increase character size of textual labels
Colour vision	Use white colours on a black background
Diminished low-light vision	Use supplemental illumination for devices used in low-light conditions
Sensitivity to glare	Use matt finishes for control panels and antiglare coating on displays
Hearing	Use auditory signals in the range of 1500-2500 Hz.
Contrast sensitivity and depth perception	Where depth perception is important, provide non-physical cues, such as relative size, interposition, linear position and texture gradient
Selective attention	Enhance the conspicuity of crucial stimuli through changes in size, contrast, colour or motion
Perception-reaction time	Give the user sufficient time to respond to a request by the system and provide advanced warnings to provide the driver with enough time to react to the on-coming traffic situation

Hand dexterity and strength	Use large diameter knobs, textured knob surfaces and controls with low resistance

In-Vehicle Information Systems (IVIS) and Advanced Driver Assistance Systems (ADAS) support the older drivers' safety. They can be classified based on when they are active in relation to normal driving and an accident (see Figure 30).

Figure 30: Categories of ADAS and Potential Positive and Negative Effects for Older Drivers.

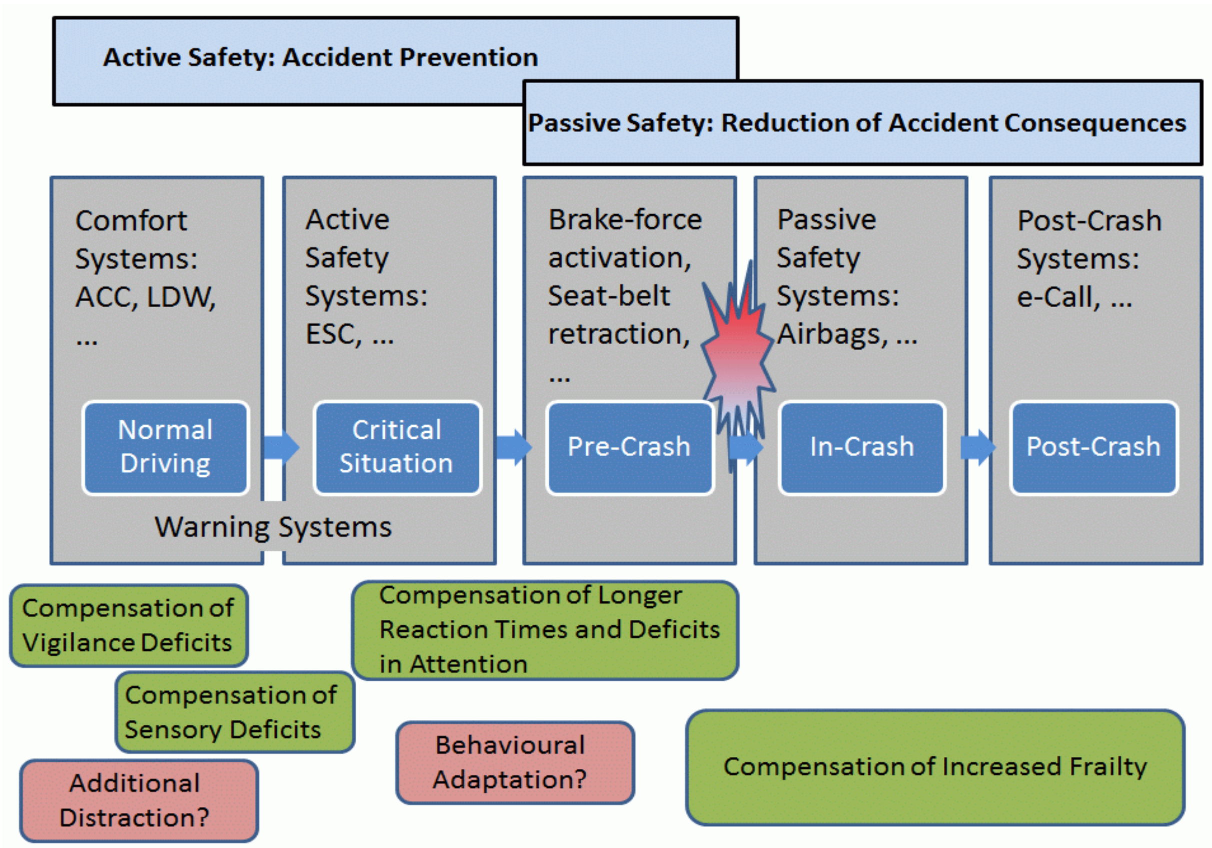


Table 22 and Table 23 give some examples of ADAS. These are discussed in more detail in the full report for WP2 Actions 2.15 – 2.18 on the SaMERU website.

Table 22: Driver Support Systems for Older Drivers (based on Guo et al, 2010)

Driver Support Systems	Assistance to Older Drivers
Adaptive Light Control (ALC)/Adaptive Front Lighting System (AFS)	Increase visibility at night time and bad weather; offer a better view of the road ahead, including other vehicles and obstacles in the distance.
Lane Departure Warning (LDW)	Alert the driver to drive within the lane when deviation occurs.
Intersection Assistant	Alert the driver to stop for the traffic from the right or offer speed suggestions according to the road signs/traffic signals, and then warn the driver if he/she performs inappropriately.
Lane Change Assistance (LCA) or Blind Spot	Warn the driver visually/audibly to avoid overtaking in critical situations.

Detection (BSD)	
Obstacle and Collision Warning (OCW)	Warn the driver when vehicles, cyclists, pedestrians or other obstacles on the road ahead are detected; prepare the vehicle for an imminent collision proactively to avoid the collision and/or mitigate the severity.
Intelligent Speed Adaptation (ISA)	Help the driver maintain a safe speed by alerting the driver (advisory ISA) or decelerating automatically in cooperation with traffic management systems (voluntary ISA) when the speed limit for a given road is exceeded.
Electronic Brake Assist System (EBS)	Take over the activity from the driver to avoid an accident or decrease vehicle speed at the moment of collision in order to reduce its seriousness.
Adaptive Cruise Control System (ACC)	Take over the activity from the driver to keep a safe distance from the vehicle ahead and avoid collision. The driver can override the system at any time.

Table 23: Relative Weaknesses of Older Drivers and Potential ADAS to Compensate these Weaknesses (Davidse, 2007)

Relative Weaknesses	In-vehicle Assistance Systems
Contrast sensitivity and motion perception	Collision warning systems for intersections Automated lane changing and merging systems
Peripheral vision and flexibility of head and neck	Automated lane changing and merging systems Blind spot and obstacle detection systems
Selective attention	In-vehicle signing systems Special intelligent cruise control
Speed of information processing, divided attention, and performance under pressure of time	Systems that give information on the characteristics of complex intersections the driver is about to cross

Although the regulations are varying, the European Union demands a uniform and legally binding renewal of driving licenses from the age of 65. However, calendar age alone is an insufficient predictor of traffic safety as shown previously in this chapter. It is assumed that the changes in motor, sensor and cognitive change are responsible for the increased accident risk of older drivers (Pottgießer, 2012; Schlag, 2008).

Although correlations were found between singular aspects of capability and traffic safety (Ball et al., 2006; Lee et al, 2003; Oswanski et al., 2007) this relationship is usually weak and only valid with tremendous uncertainty. It is thus not surprising that up to now it was not possible to prove the positive effect of screenings on traffic safety (Bohensky, et al., 2008; Dobbs, 2008; Hakamies-Blomqvist, et al., 1996; Langford et al, 2004; OECD, 2001; Ross, et al., 2011) for the few exceptions, see Loughran et al. (2007). The risk of using screening measures is that they usually do not work with enough sensitivity and specificity.

Thus, there is a strong need for further research regarding screening and assessment (Molnar & Eby, 2008, cited in Eby & Molnar, 2009, p.291):

- Design and test screening and assessment tools and/or programs using large-scale epidemiological studies across multiple jurisdictions based on objective measures.
- Translate research findings into specific recommendations for licensing agencies, clinicians, and other relevant organisations.
- Extend current focus on statistical significance to consider clinical usefulness (e.g. by identifying appropriate cutoffs and addressing sensitivity and specificity tradeoffs).
- Evaluate research outcomes within the context of how applicable and defensible they would be at the individual driver level.
- Expand the focus beyond individual measures of driving fitness to batteries of instruments.
- To determine effectiveness, expand evaluation of programs/practices to promote older driver safety and mobility.

Because ultimately older people have to give up driving, alternatives must be provided. The Beverly Foundation (2004) defined senior-friendly transportation in line with the five A's:

- Availability: Transportation exists and is available when needed (e.g. transportation is at hand, evenings and/or weekends)
- Accessibility: Transportation can be reached and used (e.g. bus stairs can be negotiated; seats are high enough; bus stop is reachable).
- Acceptability: Standards are upheld in conditions such as cleanliness (e.g. the bus is not dirty); safety (e.g. bus stops are in safe areas); and user-friendliness (e.g. transit operators are courteous and helpful).
- Affordability: Fees are affordable; fees are comparable to or less than driving a car; vouchers or coupons help defray out-of-pocket expenses.
- Adaptability: Transportation can be modified or adjusted to meet special needs (e.g. wheelchair can be accommodated; trip chaining is possible).

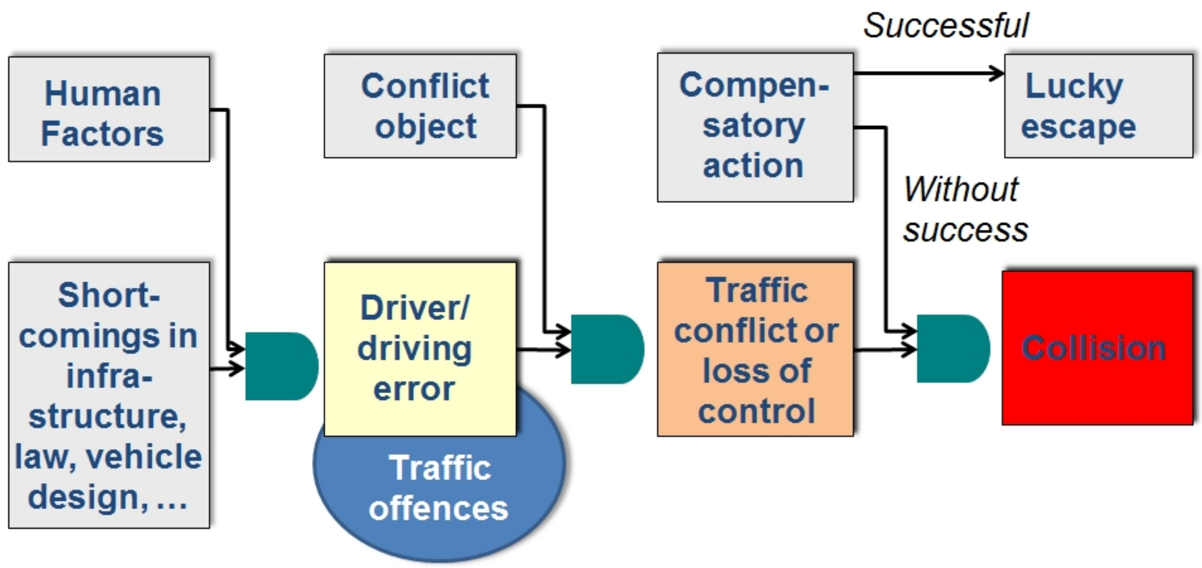
Actions 2.19-2.21: Traffic Offences

In comparison to traffic accidents, traffic offence data is analysed less frequently. The reason for this is likely to be that traffic offences are considered less important than accidents as their costs are less. However, this approach does not reflect the true importance of offences, in fact the analysis has brought to the forefront two main benefits (see Figure 31):

- Shortcomings in infrastructure, law or vehicle design can be identified.
- Analysing traffic offences can help to prevent accidents.

As shown in Figure 31, traffic offences and driver errors are a subset of each other. Traffic offences help identify locations or highway design aspects that could lead to an accident. The advantage of traffic offences and errors is that they can be registered without an accident to have happened. Because most traffic offences are accompanied by fines or penalties there usually is an administrative database which eases their analysis.

Figure 31 - Generic Error and Accident Model (Weller, Schlag and Strauzenberg, 2013)



A selection of traffic offences which are of importance to road safety have been identified below:

- Speeding
- Drink driving
- Drug driving (illicit)
- Refusing an alcohol test
- Running a red light
- Not respecting traffic signs or police
- Stop offence
- Right of way
- Not respecting pedestrian crossings
- Driving with an expired license
- Mobile phone offences
- Infringement regarding safety devices (wearing seat belt, safety helmet use)
- Not using glasses or other prescribed driving aids

Although the EU legislation sets the legal framework for these issues, the legal systems vary considerably across the EU. Thus, each SaMERU partner was asked to supply details on the national sanction regime and licensing practice. The result of this survey is shown in Table 24 below.

Table 24: Penalty Points Systems in the Partner Countries

	UK	Spain	Italy	Germany	France
Start	1995	2006	2003	1974**	1992
System	Accumulation	Loss	Loss	Accumulation	Loss
Max points	12	12	20 (30)*	18	12
Bonus points		In 2009 2 points to all drivers who hadn't lost any since 2006.	max. 10	max. 4	
Gain of bonus points		2 every three years without any loss, with a maximum of 15	2 every 2 years if no offences are committed	Points can be reduced only once in 5 years	
Driver license suspension	12 or more points in a 3-year period – 6 month suspension 2nd disqualification within 3 years -12 month suspension 3rd disqualification within 3 years - 24 month suspension	12 points loss = suspension of 6 months, after a training course possibility to get 8 points again. The 2nd time = 12 months suspension and the same system. Driver who lost twice the points can be judged.	Loss of total allocated points needed to pass a driving test (theory and practise).	**1 to 3 points:** No sanctions **4-8 pts:** No information. Voluntary participation in a counselling course results in a reduction of 4 points **9-13 pts:** Information regarding number of points. Voluntary participation in a counselling course results in a reduction of 2 pts **14-17 pts:** Compulsory participation in a counselling course. A voluntary participation in traffic psychology consulting results in a reduction of 2 pts **18 pts:** Driving licence will be withdrawn for at least 6 months. To regain driver licence a medical and psychological examination is necessary	6 months between the license suspension and the new licence (only 6 points)
Validity of penalty points Registration period	11 years for certain offences (alcohol, drugs) and causing mortal incident and	You will have to wait the three years to get back your points.	Lifetime registration for criminal sanctions, 5 years for any	Deleted every 2 years except there are new offences with points. In this case all points remain for another two years. A reduction of points is possible within the	

	UK	Spain	Italy	Germany	France
	refusing alcohol test 4 years for any other offence		other sanction	scheme outlined above	
Multiple offence	Points for the most serious offence	Max. of 6 points	Loss of max. 15 points	Points for the most serious offence	Loss of max. 8 points
Newly licensed	Maximum 3 points within first 2 years of license issue. Further points result in driving test having to be re-taken	Start with 8 points, after 3 years 12 points	Doubling of points deducted for offences in the first 3 years		Start with half of the points (6) for the first 3 years

* max. number incorporates bonus points

**new regulations are developed, but they are not yet valid

A survey was further conducted regarding the relationship between specific offences, the related sanctions and penalty points. The subsequent offences were included in this survey:

- Speeding
- Drug driving
- Drink driving
- Drink driving (causing death)
- Refusing an alcohol test
- Passing red lights
- Disregarding right of way
- Disregarding right of way (pedestrians)
- Omitting priority at a STOP sign
- Disregarding traffic signs or police agents
- Driving with an expired license
- Not using a seat belt
- Using mobile phones when driving
- Driving without helmet
- Not using glasses or other prescribed aids

Details regarding the sanctions associated with these offences can be found in the full report on Action 2.21 of the SaMERU project, titled 'WP 2.21 - Produce report on trends of collisions committed by older road users'.

Two offences including blood alcohol concentration and speed limits is shown in more detail below in Table 25, because of their general importance for traffic safety.

Table 25: Regulations on Alcohol Levels and Speed Limits in the Partner Countries.

	UK	Spain	Italy	Germany	France
Blood Alcohol Concentration (BAC) in g/l					
BAC in general population	0.8	0.5	0.5	0.5	0.5
BAC in young/ novice drivers	0.8	0.3	0.5 /0.0°	0.0	0.5
BAC in professional drivers	0.8	0.3	0.5 /0.0°	0.5 / 0.0°°	0.5 / 0.2°°°
Measurement					
BAC	Yes	Yes	Yes	Yes	Yes
Breath content	No	Yes	Yes	Yes	Yes
Physician certificate	No	No	No	No	No
Enforcement measure					
Random breath testing	No	Yes	Yes	Yes	Yes
Breath testing of drivers involved in crashes	No	Yes	Yes	Yes	Yes
Blood testing of all drivers involved in crashes	No	Yes	Yes	Yes	Yes
Police checkpoints	No	No	Yes	Yes	Yes
Speed limit (km/h)					
on urban roads	48	50	50/70	50/30	30/50
on extra-urban roads	97	90/100*	90/110*	100	90/110**
on the motorway	112	100	130/150	130***	130

Notes:
° since 2010 for drivers below 21 years, first 3 years for newly licensed drivers, professional drivers
°° passenger transport
°°° bus driver
* depending on the number of lanes
** dual carriageways with at least 2 lanes in each direction
*** recommended where there is no regular speed limit

The legal basis on driver licensing is the EU Directive 91/439/EC which was in force across the EU until January 2013. It is the second Directive on driver licensing and will be updated by the Directive 2006/126/EC, which further enhances the harmonisation process. The new law requires a common format licence, harmonisation of categories and common standards of competence and fitness to drive, harmonised period of validity of the driving licence document aimed to reduce the possibilities of fraud, guarantee a true freedom of movement for EU drivers and reinforce safety on European roads.

Amongst others the law:

- regulates duration of the administrative validity period of a licence (as an anti-fraud measure). The validity of a new driving licence of categories A and B will be 10 years - although Member States may extend it to 15 years. Validity of licence categories C and D is set to 5 years.
- regulates a minimum standard of mandatory medical checks for the renewal of the C and D licence holders. So far, for licenses C and D medical examination before the first issue

and, thereafter, periodic examinations according to the national legislation. The new law introduces periodical medical checks for these groups.

Table 26 illustrates the situation in each partner country and comprises a summary of regulations regarding newly licensed and older drivers, the minimum age of licensing by vehicle type and the fitness to drive assessment procedures. The rules apply to non-professional drivers only.

Concerning the fitness to drive assessment, various practises exist. In some countries mandatory medical examination for every licence holder is required, among them are Spain and Italy. In these countries periodical medical testing is required for every licence holder after obtaining the driving licence independently of the driver's age. Starting and periodicity of assessment is fairly identical in the two countries. In Great Britain there is no mandatory medical test required, but a medical self-declaration for license holders aged 70 and over.

In other countries, among them Germany and France, there is no mandatory fitness to drive test required. However, due to the new EU Directive 91/439/EC the situation in France changed by January 2013 from unlimited validity to required administrative renewal every 15 years.

In all countries in the presence of certain pathologies special requirements for licensing and renewal are applied. In some countries such as Great Britain medical doctors are required to report to the authorities if they suspect their patients to be no longer fit to drive.

Fitness to drive evaluation differs widely in Europe. As regards older drivers the OECD report on Ageing and Transport (OECD, 2001) highlights that the benefit of mandatory medical driver assessment of older drivers is not very clear and concludes that restricted driving renewal should be based on functional ability and not on the age criteria and presence of certain pathologies.

In countries such as Italy and Spain every driver is required to undertake mandatory medical testing, even though the frequency of renewal is increasing by ageing.

Table 26 : Driving Licensing and Renewal by Partner Country

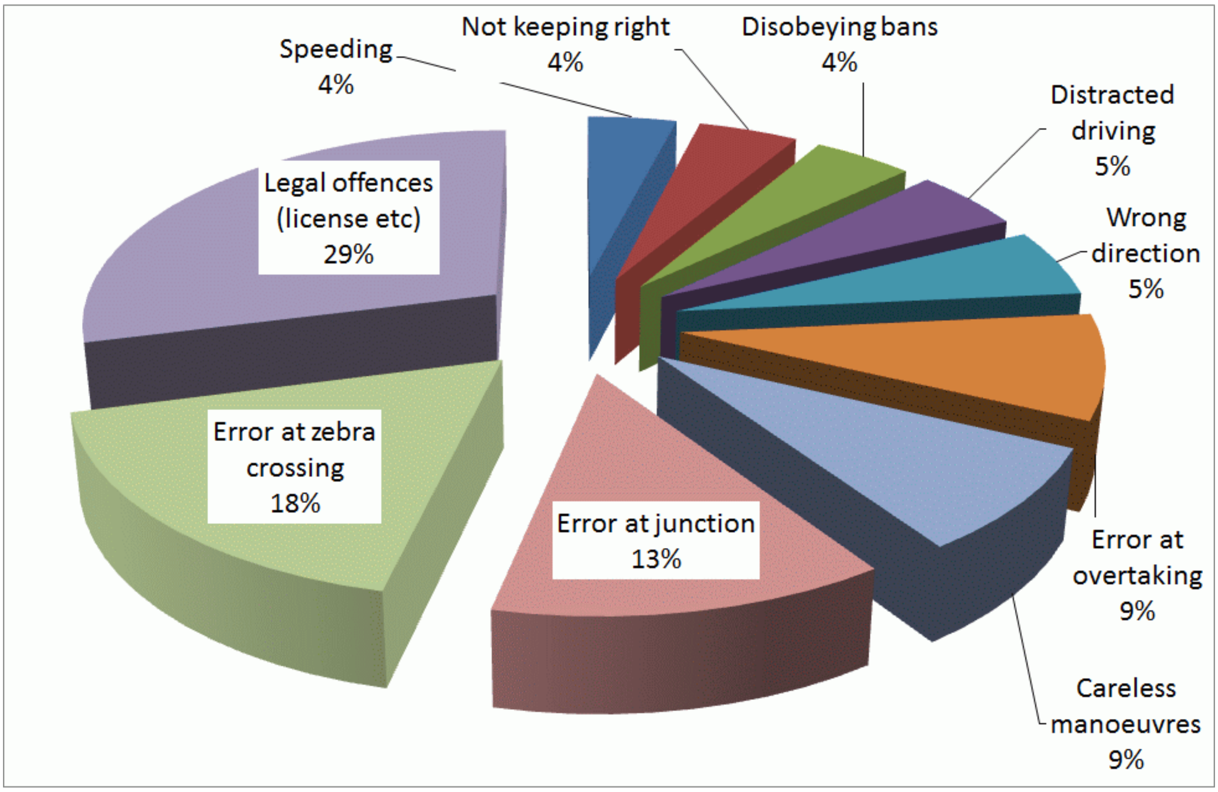
	UK	Spain	Italy	Germany	France
Rules for newly licensed driver	Probationary period for the first 2 years	Probationary period for 1 year (affixed L-plate on the vehicle) and speed limit of max. 80 km/h. A new law of 2012 allows new drivers to drive up to 110km/h on motorways.	Probationary period for the first year limitation to drive vehicles with reduced power (<55kw/h)	Probationary period for the first 2 years	Probationary period for the first 3 years, reduced to 2 years for drivers who attended the early learning sector driving during adolescence
Minimum age for licensing: Car[1]	17	18	18, accompanied driving for drivers aged 17	18, accompanied driving for drivers aged 17	18, accompanied driving for drivers aged 16
Validity of license	Limited	Limited	Limited	Unlimited	Limited
Rules for older drivers? Validity of licenses A and B	Validity up to 10 years, although entitled to drive until age 70 if no medial restriction From age 70 mandatory renewal every 3 years without upper age limit	Every 10 years after obtaining driving licence until 45 Every 5 years between 45 and 70 Every 2 years thereafter	Every 10 years for drivers under the age of 50 Than every 5 years between 50 and 70 years of age Every 3 years between 70 and 79 Thereafter every 2 years	Unlimited	Limited due to European license. Administrative limitation, renewal: every 15 years
Validity of licenses C and D	Issued at age 21. After age 45, renewal every 5 years until age 65, than yearly, without upper age limit	Valid for 5 years before age 65, thereafter every 3 years	C (D): Until age 65 (60) every 5 years, afterwards 2 (1) year validity After age 68 licence D no longer renewable	Valid until age of 50, renewal every 5 years	Valid for 5 years until age 60, for 2 years until 76, and for 1 year after
Administrative	Yes	Yes	Yes	No	Yes

[1] For mopeds and motorcycles see full report.

	UK	Spain	Italy	Germany	France
Renewal					
Fitness to drive: Mandatory medical testing	No. Medical self declaration of ability. DLVA requires confirmation at age of 70 that no medical disability is present, thereafter a 3-year licence is issued subject to satisfactory completion of medical questions on the application form.	Yes	At each renewal, a doctors' certificate is required. Entitled Medical doctors, usually from a LHU structures	No	No
Procedures for certain medical conditions	Yes, see full report	Yes	Yes, see full report	Yes	Yes

Further to the survey amongst the partners regarding offences, an in depth analysis of local data on offences was conducted in the partner cities of Burgos and Modena. Figure 32 shows an example of data from Modena. This data was aggregated for the years 2010 and 2011 and for several offences.

Figure 32: Aggregated Traffic Offences of Older Drivers (65+) in Modena Between 2010 and 2011.



This shows that legal offences are the highest category of offences for older drivers. This is probably due to the legislation which requires regular administrative renewal of the driving license as shown in the Table 26.

The second and third largest categories of traffic offences are related to errors and are thus related to accident occurrence which gives valuable information on the locations of accidents which involve older drivers.

The least frequent category is speeding. This is in line with data from other European countries and reflects the fact that a reduction of speed is a common means for older drivers to compensate increasing demand (see the full report on Action 2.18 in SaMERU).

Work Package 3 - Public Space Ergonomics and Highway Environments

Work Package 3 Structure

In the original bid document for the SaMERU project this work package was divided into two sections. Firstly, public space ergonomics and secondly the road (highway) environment. Whilst reviewing the available data, it became apparent that elements of these two sections were inextricably linked and separating the sections would result in duplication of certain subjects. So it was decided to re-write the structure of this work package as follows:

Action 3.1 Investigate the following types of Public Space and Highway (Roads) Environments

a. Pedestrian areas (no access, or limited access for vehicles)
b. Shared surfaces (Vehicles, cyclists and pedestrians)
c. Footways (adjacent to carriageways)
d. Traffic Signs
e. Intersections
f. Right turns UK (left turns in other EU countries)
g. Road markings (guardrailing?)
h. Traffic signals (including pedestrian crossings)
i. Visibility splays at junctions
j. Highways (Roads)

Identify road environments in partner cities that are perceived to be of concern by elderly road users particularly considering the effect of layout, street clutter and obstructions on safety and accessibility. Where possible, use evidence from accident records in the partner cities.

Footpaths (separate from carriageways), traffic signs and visibility splays at junctions were not included separately in this section regarding difficulties because there was not sufficient data collected on these topics.

Action 3.2 Produce a report that highlights the difficulties facing elderly pedestrians in areas a) to j) above. Make recommendations for generic changes or good practice to make such areas of road safer for the elderly to use in the future.

The topic, footpaths (separate from carriageways), was not included separately under this action because there was not sufficient data collected to merit a separate section.

Action 3.3 Have regard to the effectiveness and value for money of these improvements and consider how such actions could be prioritised and implemented across the Member States of the European Union.

Introduction

This report investigates the difficulties facing the elderly in pedestrian dominated areas including pedestrianised areas, shared surfaces, footways and other highway environments that are found in many towns and cities including the partner cities.

Pedestrian areas with no access, or limited access for vehicles, shared surfaces for vehicles, cyclists and pedestrians, footways (adjacent to carriageways) and footpaths (separate from carriageways) are all areas where pedestrians should have priority. Shared space should be referred to as 'better streets' where the aim is for the car to be less dominant on the highway and to afford more opportunities for the pedestrian (and cyclist) to be given priority by the car. In addition, some comments regarding individual types of highway environments are sometimes also relevant to some or all of the other types of highway environment.

The report brings together the findings of a variety of research and information that consider the perceived and actual difficulties facing the elderly when using a wide variety of highway situations. In summary, there are 5 key areas of information that have been used to evidence the recommendations and conclusions for this report as follows:

1. Research through liaison/consultation with elderly road users – 'perceived' issues;
2. Specific site studies that have been undertaken in Southend and with SaMERU partners;
3. Other research papers – including from other European projects;
4. British Transport Engineer Design Guidance; and
5. Legislation.

Details about all these sources of information are provided below and in the papers that the SaMERU partners have provided shown on the SaMERU website www.sameru.eu.

The accident reports utilised in WP3 are largely those written under WP2. Partners were asked to identify locations that are potentially hazardous to elderly road users in the partner cities. Burgos, Lancashire, Modena and Southend have undertaken a number of studies that have examined the 5 key locations in their towns or cities where there have been clusters of accidents causing injuries to pedestrians and drivers involving elderly persons. Other analysis has been undertaken regarding the effectiveness of various highway improvement schemes in the partner cities as well as other cities in Europe and beyond according to the available evidence.

An appraisal has been undertaken of all the data collected to see if particular highway schemes provide safer and more accessible highway environments for the elderly and whether there are particular design guides/information that would provide more appropriate techniques for designing future highway schemes.

The focus of this report, including the design improvements, is for the older pedestrian. The needs of the older driver are also considered but the focus of the design issues has been on the older vulnerable highway user. The report entitled WP 2 Actions 2.15 – 2.18 (Weller, 2013) provides additional detailed design advice regarding left turns (right in the United Kingdom, Ireland, Malta and Cyprus), 90° intersections, signage and markings, colour contrast, lighting of signs, rumble strips and roundabouts.

Summary of the Information Reviewed

1. Research Through Liaison and Consultation with Elderly Road Users – 'Perceived' Issues

We have carried out research into the effect of street layout, street clutter and obstructions on the perceived and actual safety and accessibility at different highway locations under the SaMERU project. The following key areas have been examined:

- Postal questionnaires used in Burgos, Southend, telephone questionnaires in Modena;
- Stakeholder meetings held in Burgos, Modena, Lancashire, and Southend;
- Travel diaries for Lancashire, Southend, Modena and Burgos;
- Social Research Associates Limited (2013) The Effectiveness of Highway Improvement Schemes in Reducing the Risk of Accidents to Elderly Pedestrians (WP2);
- Social Research Associates Limited (2012) Survey of Elderly Pedestrians in Southend and Lancashire; and
- SaMERU Final Conference held in March 2013 (including discussion groups).

2. Specific Site Studies that have been Undertaken in Southend and with SaMERU Partners

Design Reviews by Urban Movement - 'Better Streets' for two areas of Southend. One study was for the City Beach project and the other for the Victoria Gateway. These two new highway improvement schemes have elements that are considered to constitute pedestrianised areas, shared surfaces and footways adjacent to carriageways. Actions included:

- Identifying locations potentially hazardous to elderly road users in the partner cities (available for Southend, Lancs, Burgos and Modena);
- Investigating numbers of recorded accidents to elderly pedestrians in the partner cities;
- Studying the effectiveness of highway improvement schemes in reducing the risk of accidents (Social Research Associates (SRA) (2012);
- Recommending potential solutions including road design and speed limits; (Technical University of Dresden (TUD))
- Reviewing cycle friendly schemes (before and after collision data comparison) and Mobility Scooters Report; and
- Final Conference presentations.

3. Other Research Papers

- IFSTARR - details of the research that IFSTTAR undertook can be found under WP1;
- Technical University of Dresden – Mendeley – the purpose of Mendeley is to provide the reader with a list of publications that covers the principal issues affecting the safer mobility of elderly road users. A series of slides has been produced that describe in detail how to use Mendeley. Although they were created for the benefit of the project partners, they may also be used for those who want to download the bibliography from the SaMERU-Group. These instructions may be found by visiting www.sameru.eu. The documents on Mendeley were reviewed as part of the preparation of WP3;
- Institute for Advanced Motorists (IAM);
- Europa.eu/legislation_summaries/transport/road_transport/tr0036_en.htm Road Safety – Policy orientations on road safety 2011-2020;
- Europa.eu/legislation_summaries/transport/road_transport/0036_en.htm – Road Safety – community database on road traffic accidents;
- I'DGO – Inclusive Design for Getting Outdoors;

- ISEMOA – the European project ISEMOA Improving Seamless Energy-Efficient Mobility Chains for All;
- MEDIATE – methodology for describing the accessibility of transport in Europe;
- CONSOL – reports on accident and population statistics; and
- AENEAS – the European Project AENEAS Attaining Energy-Efficient Mobility in an Ageing society.
- U.S. Department of Transportation, Highway Design Handbook for Older Drivers and Pedestrians (Staplin et al, 2001)

4. British Transport Engineer Design Guidance

- Department for Transport (1992), DMRB (Design Manual for Roads and Bridges)
- Department for Transport (2011) Shared Space LTN/1/11;
- Department for Transport (2009) Pedestrian guardrailing LTN 2/09;
- Department for Transport (2002) Inclusive Mobility: A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure;
- Department for Transport Mobility Unit Guidance on the Use of Tactile Paving surfaces www.gov.uk/government/uploads/system/.../tactile-paving.pdf [accessed: 1st August 2013];
- PACTS – It's my choice;
- Transport for London (2009) Streetscape guidance: A guide to better London streets - documents making reference to the needs for the elderly:
  - 7: Technical Guidance: Footways and Carriageways
  - 8: Technical Guidance: Street Furniture
  - 10: Maintenance and Management;
- Department for Transport (2007) Manual for Streets;
- Department for Transport (2010) Manual for Streets 2;
- Royal Society for the Prevention of Accidents (RoSPA)(2010) Older Drivers Policy Paper www.rospa.com/roadsafety/policy/statements/older-drivers.aspx;
- Southend on Sea Streetscape Manual; and
- Transport for London – Surface Transport – Roads Directorate – Guidance on the Assessment of Pedestrian Guardrail.

5. Legislation

- Equality Act 2010 (superseding Disability Discrimination Act 1995) - You're disabled under the Equality Act 2010 if you have a physical or mental impairment that has a 'substantial' and 'long-term' negative effect on your ability to do normal daily activities;
- The European legislation underlying this act include the following 4 Equal Treatment Directives:
  - Council Directive 2000/43/EC implementing the principle of equal treatment between persons irrespective of racial or ethnic origin;
  - Council Directive 2000/78/EC establishing a general framework for equal treatment in employment and occupation;
  - Council Directive 2004/113/EC implementing the principle of equal treatment between men and women in the access to and supply of goods and services; and
  - European Parliament and Council Directive 2006/54/EC on the implementation of the principle of equal opportunities and equal treatment of men and women in matters of employment and occupation (recast). Also relevant in this context is Article 157 of the Treaty on the Functioning of the European Union; and
- Directive 2008/96/EC – Safety Management of Roads (Road Safety Audits).

Research Methods
Through the stakeholder consultation undertaken under WP1.3, several surveys and workshops were held to seek to identify the difficulties facing the elderly in all the types of highway. A summary of the key results identified are included in this WP3 report. However, further details are contained in the specific reports prepared to record the outcome of the various stakeholder meetings and surveys.

WP3 also includes a review of best practice to consider difficulties facing elderly pedestrians and drivers as well as a review of interventions, actions and recommendations in European and International cities. There is a plethora of design guides and research. However, it is not all relevant to the areas being considered in the SaMERU project. The desktop search made use of publicly available information from sources such as the Department for Transport (DfT), local authorities and the European Commission. In seeking to find relevant information, key word searches were undertaken such as wheelchair, mobility, elderly, disabled, disability, dda, visual, equality impact assessment, older.

Action 3.1 Difficulties Facing the Elderly in Public Spaces and Road Environments

Key Stakeholder Issues identified through Public Consultation

Consultations were undertaken by the partners in Burgos, Lancashire, Modena and Southend on Sea. The key consultations that linked directly with WP3 were the postal questionnaire and two stakeholder meetings that were undertaken in Southend specifically regarding the design of certain types of highway environment including public transport facilities for travelling by bus. More detailed reports can be found in WP1. A summary of the key findings is provided below:

Third SaMERU Stakeholder Meeting 26/11/12, Highway Design Issues and Solutions (Work Package 3)
The key observations from the workshop are as follows:
- A wide range of views were expressed according to individual circumstances and needs;
- Agreement regarding the need for wider footways to accommodate all likely users;
- The need to control the use of footways;
- Informal highway design causes confusion to both drivers and pedestrians alike;
- PUFFIN crossings require improvements to include countdown facilities;
- All bus stops need shelters;
- Turning right at junctions requires particular care; and
- Many cars are driven too fast.

The key suggested improvements were as follows:
- As with issues, the suggested improvements varied with each respondent;
- Speed reduction was suggested;
- Pedestrian crossing improvements were suggested, particularly longer crossing time;
- Informal road layouts cause confusion and uncertainty; and
- Obstructions on the footway including parked vehicles and bicycles to be controlled more.

SaMERU 4th Stakeholder Meeting Report, Bus Travel in Southend on Sea 14/02/13
The workshop found that the most important highway design issues regarding travelling by bus were:
- More audible and visual information at bus stops would be very helpful;

- Travellers wanted good quality bus shelters with protection from all weathers;
- Less obstacles on footways;
- Clear (well lit) timetable information;
- Short walks to bus stops;
- Well lit streets;
- Pedestrian crossings in good locations with countdown facilities;
- Designers should take more account of elderly needs on footways and at bus stops.

SaMERU Postal Questionnaire Report (2013)
The questionnaire was used in Italy, Spain and the UK. The key highway design issues were as follows:
- Potholes - maintain our highways and footways better;
- Need longer and clearer crossing time on PUFFIN crossings;
- Tactile paving needs to be redesigned;
- Consistency in design needed;
- Control cyclists and mobility scooters on footways - enforcement or make them wider.

Summary of Other Relevant Research

IFSTTAR undertook a significant review of literature regarding the factors influencing the safety and mobility of older road users. The main consequences of age related health declines are:
- Safety in terms of involvement in collisions and falls; and
- Performance in terms for example, of adopted speed, latency or scanning behaviour.

The following sensorial changes are related to the reduction in the safety and mobility of elderly road users:
- Dark adaptation and glare sensitivity;
- Visual acuity (acuteness);
- Contrast sensitivity;
- Usual field of view;
- Visual field;
- Visual motion sensitivity; and
- Hearing and touch.

Further details can be found in report WP1.6.

For older drivers the link is weak between visual functions and collision involvement because it may be countered by generally driving less, cessation of night driving and not driving in unfamiliar areas.
A diminution of visual acuity may cause difficulties in perceiving vehicles in complex road environments and cause an increased risk of falls for pedestrians. For example, such visual impairments can impede the discrimination of fixed objects such as kerbs and pavements and of moving objects, such as oncoming vehicles. The latter can result in unsafe crossing decisions.

Hearing helps to improve awareness of the presence of vehicles and to spatially locate them. Therefore, elderly pedestrians with hearing impairments are likely to have difficulties detecting vehicles approaching from behind or turning (this could also explain why older people so dislike cyclists on footways).

Cognition refers to all forms of knowing and awareness, such as perceiving, remembering, reasoning, judging, imaging, and problem solving. Although less frequently investigated, other modes of transport such as walking, cycling or using public transport are also cognitively demanding. For example, pedestrian mobility demands attention, spatial navigation and road crossing decisions. Cognitive functions tend to decline during ageing but with large variations between people. All these cognitive changes can lead to an increase in the risk of collisions, more hazardous road crossings and the risk of falls.

It is thought that at any given time, around 30% of pedestrians have impaired mobility (temporary or permanent health impairments). Due to the ageing of the population in many countries around the world, public authorities must prepare for a future where a growing number of highly vulnerable people will be even more dependent on walking. It has been identified that people with impaired mobility, using wheelchairs or mobility scooters, have similar requirements to pedestrians for an environment that facilitates accessibility (International Transport Forum, 2011).

The I'DGO project revealed that designers have limited knowledge of how to consider the needs of older people in the design of streets and neighbourhoods. The project did find that people felt unsafe after dark, which could affect their travel behaviour (I'DGO, 2007).

Research by I'DGO in 2007 sought to understand how older people assessed their quality of life. I'DGO found that 'the quality of the environment is conceptualised here as the extent to which it facilitates or hinders participation in activity outdoors, hence the term "supportiveness" of the environment.' 'A supportive environment is one where the user finds comfort, pleasantness, safety and lack of nuisance'. 'Those who live in a very supportive neighbourhood were about 3 times more likely to be in good health compared to those living in a poorly supportive neighbourhood.' Thus the quality of the street environment is very important to older people's mobility and therefore their health.

Older people go out into their local environment frequently, regardless of the season, and walking is very much the predominant form of transport. Research undertaken for the I'DGO project discussed walking distances to destinations and how long it took people to walk to local facilities and amenities. This is summarised in Table 27.

Table 27 - Walking Distances to Destinations

Destination	Walking distances
Food store	Nearly two-thirds of participants reported they were within 10 minutes' walking distance.
Newsagent	The recommended distance is 5 minutes walking but less than half were within this.
Main Shopping Centre	Around 60% of participants said they were within 20 minutes' walking distance.
GP/Health Clinic	Almost one-quarter said they did not know how long it would take them to walk because the distance meant that they needed transport to get there. Of those who knew, not many (36%) were within the recommended (10 minutes') walking distance.
Chemist	About half were within 10 minutes' walking distance.
Post box	These seem to be very frequent: nearly three-quarters of participants reported being within the recommended 5 minutes' walking distance and nearly all were within 10 minutes'.
Park/Green area	Nearly two-thirds said they were within 10 minutes of a park or other green space and a high proportion (78%) said they were within 20 minutes.
Bus stop	A high proportion (88%) said they were within 10 minutes of a bus stop. However, they did point out that the buses did not necessarily go to the right places or frequently enough!

In Australasia, and in the United Kingdom, road design manuals outline design criteria for the geometric design of roadways based on sound engineering practice. For the most part, these criteria have been developed primarily in regard to the performance capabilities of the 85th percentile 'design driver', that is, fit and relatively healthy young adults (Fildes etc et al, 2000; OECD, 2001; Waller, 1991) and therefore make little if any allowance for older drivers' performance. The 85th percentile is based upon the performance of vehicles and does not take into account the different skills and or abilities of drivers. Effectively, this means it is important to reduce speed or providing improved protection of those road users most at risk through infrastructure and other changes (Oxley, 2006).

Pedestrian Areas (No Access, or Limited Access for Vehicles)

A lack of benches for resting purposes has been identified as a key issue for elderly persons relating to the difficulty in walking a long distance because of health conditions associated with ageing, such as short of breath and lack of stamina. (I'DGO, 2007; OISE, 2007; Sra, 2013). A survey also revealed that a further issue is a distinct lack of accessible public toilets (I'DGO, 2007).

A review of evidence in Ireland on injuries among older people in the context of environmental health, noted that evidence from the United States, New Zealand, and the UK suggests approximately one third of those aged over 65 fall each year (Rowe, 2000). Falls are the leading cause of injury-related visits to emergency departments in Ireland (Sra, 2013). The survey undertaken by the I'DGO project also found narrow poorly maintained paving to be a key issue (I'DGO, 2007).

Shared Surfaces (Vehicles, Cyclists and Pedestrians)

Southend Borough Council has undertaken two highway improvement schemes in the past two years that reflect the principle of returning some areas of highways/streets back to the pedestrian and cyclist. Whilst originally referred to as 'shared space' schemes they do not constitute shared space in the true sense of the expression because both areas still have high levels of motor vehicles crossing parts of these schemes. Both of these schemes have been reviewed by John Dales (2011) on the success of modifications. The Victoria Gateway scheme was one of the sites identified in Southend with a cluster of accidents and considered one of the 5 most hazardous locations in the town.

Scheme 1 City Beach Project

The City Beach project comprised the following highway improvements:

1. Realignment of the carriageway and removal of the central reservation, to create wider pavements with spaces for cafes on the north side of the street;
2. Relocated parking to site perimeters with good pedestrian connections to the seafront; and
3. Introduced the concept of shared surface treatment to the road and footpaths to slow traffic speeds and improve physical connections across the road and improve pedestrian connections to the beach and town centre.

'Before and after' collision data was collected and analysed. From the five years of data available before the scheme was implemented 26 collisions were recorded. However there were no identifiable patterns from the before or after data as to why these collisions had occurred.
In the pedestrian survey by Urban Movement (2011) it was suggested that most drivers read the street layout as conventional, and did not readily give way to pedestrians waiting to cross. It should be noted that there was no evidence that the presence of a formal crossing would have helped prevent any of the recorded collisions (Urban Movement, 2011).

The key issues identified by stakeholders after the completion of the project were as follows:

1. Shared space – the use of the term shared space by the press had led to confusion about what the new scheme was intended to achieve. For that reason the term 'better street' was introduced;
2. Scheme transition/signage – may be confusing as it is new;
3. Vehicle speeds – even though vehicles generally adhere to the 20mph speed limit in some areas even lower speeds would be helpful;
4. Pedestrian crossings - many of the stakeholders wanted these crossings to be more obviously defined in some way, particularly stakeholders representing blind and partially sighted people;
5. The 'cannon balls', that were a substitute for kerbs, were found to be a trip hazard for stakeholders representing blind and partially sighted people; and
6. Cyclists sharing the footway - concern was expressed regarding pedestrians fear of being hit by a cyclist – particularly the blind and partially sighted pedestrians.

Scheme 2 Victoria Gateway Public Realm Improvement Scheme

The Victoria Gateway Public Realm Improvement Scheme is located in the centre of Southend near Victoria Railway Station at A127 Victoria Avenue, A13 Queensway and A13 London Road junction.

The Victoria Gateway area was transformed from a large, four arm roundabout to a smaller, though still multi-lane, three armed signalised T-junction. A large and inaccessible oval green space in the centre of the roundabout is now an easily accessible hard-paved space to the north that is contiguous with the station forecourt and a small, hard paved space to the south that provides a more direct link to the High Street. Limited traffic, largely taxis and buses, is allowed to move through the northern open space. Formal crossings are provided on A13 Queensway and A127 Victoria Avenue for pedestrians and cyclists. The scheme designers sought the use of the "shared space" concept from the outset to increase pedestrian and cycle priority.

The Stage 4A Road Safety Audit examined details of three years of personal injury accidents (pia's) in the area before the scheme was constructed. 28 pia's were recorded - 3 serious accidents and 25 slight accidents. No fatal accidents were recorded in this period. The severity index was 11%. In the 15-month period after operation commenced, 8 pia's were recorded by the Essex Police. Although the annual rate of accidents declined, the severity index increased to 25% because two of the eight accidents involved serious injuries. However, data sets for pia's are normally considered over a 3-year period, so this does not provide a statistically reliable set of data. Accidents involving pedestrians are still occurring, but at a reduced rate compared to the 'before' scheme situation. A further audit will be undertaken when three years of data are available (summer 2014).

The audit did not specifically examine the needs of the elderly but sought to examine the safety issues affecting all highway users. However, issues identified that may be relevant to the needs of the elderly road user are as follows:

- A lack of 30mph signs at the approach to the scheme may have contributed to the increase in the number of nose to tail collisions on the A13 Queensway eastbound carriageway. The report recommended that this issue should be resolved;
- The signal head is not clear to all road users on Chichester Road northbound to Queensway. This should be re-designed as it may also contribute to nose to tail collisions;
- Tactile paving from the central reservation towards Queensway north kerb needs to be re-aligned because is not pointing straight across the road. This could lead to mobility handicapped pedestrians being directed too far east. This also occurs near the Deeping junction;
- Pedestrian/cyclist signs are often very small, particularly on the southern side of Queensway and therefore more appropriate sized signage is sought;
- The gradient of the footway on the western side of the station is rather steep and a handrail is required at the steepest point to help pedestrians negotiate the slope;
- Footway near Victoria Station car park. Additional guidance is required for pedestrians crossing the bus/taxi lane and exit to car park to warn pedestrians of possible vehicles; and
- There is little guidance to help blind/ partially sighted pedestrians to travel to the Toucan crossing from Victoria Station to the Toucan crossing near the former Deeping junction. The guidance needs to be extended.

Walking has a very high importance for older persons in all AENEAS cities and is the most frequent mobility mode. The previous dominance of mobility over accessibility in planning decisions has resulted in urban design that prioritises motorists and personal car use. Even where destinations are geographically near, they are often separated from the people that need them by busy and wide roads, or railways, that prevent or make it difficult to access them by foot and bike (Sustrans, 2010 cited in BMA, 2012). The elderly or disabled are at particular risk of suffering the negative consequences of community severance (Royal Town Planning Institute 2008 cited in BMA

2012) for example, dissuaded from using a route due to safety concerns, noise levels, and air pollution from fast-moving traffic.

Typically, older people look more carefully and wait for longer gaps between vehicles before trying to cross. However, they appear to accept gaps that are not long enough to allow them to cross safely unless the approaching vehicle slows down. They may be basing their judgements on distance rather than allowing for the speed of a vehicle as well as its distance. An observational study found that older women are more likely than other pedestrians to take account only of nearside traffic before starting to cross, attending to farside traffic once they have reached the middle of the road (Dunbar G, Holland CA, Maylor EA, 2004).

Ward et al. (1994) also found that older pedestrians tend to be injured on roads close to home – 73% of the older pedestrians were injured less than 1km from their home and 42% within 400 metres of their home. Older people who live in urban areas, who cross at junctions and whose everyday pedestrian activity involves crossing main roads locally, will be at higher risk of accident and fatality in the road environment which can be partly explained by the greater frailty of older people (Dunbar G, Holland CA, Maylor EA, 2004). An American study examining vehicle-pedestrian collisions and the collision types in which older pedestrians showed the young-elderly (ages 65-74) were most likely to be struck by a vehicle turning right, whereas the old-elderly (age 75 and older) were more likely to be struck by a left-turning vehicle (Staplin L, Lococo K, Byington S & Harkey DL, 2001).

Footways (Adjacent to Carriageways)

A specific challenge identified by stakeholders was the fear of having an accident due to potholes (arising from a lack of maintenance) and cyclists on pavements. Research has also highlighted other areas of concern as follows:

- Trip hazards - older pedestrians may have different visual search patterns to other pedestrians, tending to spend a greater amount of time looking down in order to better place their feet to avoid falls. (Road Safety Committee, Parliament of Victoria, 2003). A further implication to this is being less able to monitor the traffic and more prone to be taken by surprise or fail to see vehicles when crossing the road (SRA, 2013);
- Personal Safety - addressing the need to control vegetation on driveways has been identified by older pedestrians as one of the key aspects of a community safety intervention in Sweden (Lindqvist et al. 2001 cited in Dunbar G, Holland CA, Maylor EA, 2004);
- Personal Safety - fear of crime and undesirable young people (especially when in groups) (I'DGO, 2007);
- Accessibility - mobility scooters and electric wheelchairs are a concern for pedestrian safety, as they compete with pedestrians for space on footways and at crossing points. As they become increasingly popular, they pose new challenges for balancing the safety of all road users in busy town centres (SRA, 2013);
- Accessibility - cars parked on pavements make it difficult for everyone to walk, especially older people with mobility impairments. Areas of heavy traffic, particularly in conjunction with poor provision of pavements or location of traffic lights also make walking and crossing the road difficult and unpleasant (I'DGO, 2007);
- Accessibility - few older people were aware what the different types of tactile paving signified; a challenge exacerbated by incorrect provision. Those with balance problems felt unsafe walking on tactile paving because it affected the rhythm of their gait, indicating that their balance was affected. Many people found the 'blisters' uncomfortable and regarded them as a slip hazard when laid on a steep slope, or when wet or icy (brass and steel studs

had a high slip potential). None of the 30 sites studied by I'DGO met the recommended Light Reflectance Value, meaning that the tonal contrast between tactile and surrounding paving was insufficient for many visually impaired people (I'DGO, 2012);

- Accessibility - zebra crossings should not be located too close to roundabouts (Modena); and
- Facilities – in various towns in the UK there was very little seating on streets and older people suggest that there is insufficient seating in public places and en-route to destinations (I'DGO, 2012).

Intersections

Stakeholders identified there are a general lack of formal crossing points and the need for providing a high standard of road surface at existing formal crossings. A review of crossing times was suggested as older persons identified the need for longer crossing times at formal crossing points. This section outlines intersection difficulties faced by older drivers and older pedestrians.

Pedestrians
It should be noted that 38% of pedestrian deaths of people aged 65 and over occurred at intersections in 2008 in the US (IIHS 2000 cited in Staplin L, Lococo K, Byington S & Harkey DL, 2001). Elderly people avoided using formal crossing points if it meant going out of their way. It is thought that walking difficulties are likely to have influenced these decisions. These were also the conclusions of a road safety study of older people in Northern Ireland, which found that older pedestrians think controlled facilities do not allow enough crossing time and that only 57% of older people feel safe as pedestrians (Atkins, 2012; Sra, 2013).

Drivers
As drivers grow older, certain activities become more difficult such as reading signs, crossing or turning at an intersection, seeing traffic at poorly lit intersections, following road markings and kerbs and responding to traffic signals, especially people aged 77 or older. Turning at intersections was perceived as a complex driving task (Staplin L, Lococo K, Byington S & Harkey DL, 2001).

The task of negotiating an intersection is only thought to be difficult for older drivers if the traffic situation is complex and drivers have to cope with traffic that is about to cross their path. Complexity is expected to increase with:

- The amount of information to be processed – number of lanes and traffic signs, presence of pedestrian crossings;
- The reduction of the quality of the information – visibility of signs and pavement markings; and
- Time Pressure – presence of trees, houses or cars that block the view of the intersection and reduce the time left to anticipate on what is coming.

Complex situations put a strain on the sensory, perceptual and cognitive capacities of the driver, which are often reduced in older age groups (Bouwer WH & Ponds RWHM, 1994; Fish AD & Rogers WA, 1997 cited in Davidse R, 2007).

It was found that older drivers have longer reaction times than younger or middle aged drivers and they tend to make unsafe decisions at intersections such as dual carriageways, roundabouts and four-way intersections. If a situation is similar to a known situation but is slightly different it may lead to the selection of inappropriate actions and make the task more difficult instead of easier (Davidse R, 2007).

Older drivers have been identified as having greater involvement in accidents at junctions. In several US analyses (Mayhew DR, Simpson HM, Ferguson SA, 2006; Ulfarsson GF, Kim S, Lentz ET, 2006 cited in Davidse R, 2007) of accidents involving older drivers, turning across a lane of traffic was identified as the most dangerous manoeuvre at an intersection. In this type of accident, the older driver was more likely to be at fault. The reasons behind this high collision risk were failure to follow the traffic law, such as failure to give way to traffic which had the priority or disregarding a traffic signal. There is some evidence that the main reason for failing to follow the law at an intersection changes with age. One US study compared older drivers with a control group of drivers aged 35- 54 years. It found that drivers aged 70-79 years made more mistakes where they identified the hazard but misjudged the time available to complete the manoeuvre, whereas drivers 80 years and older predominantly failed to see or detect the other vehicle in the first place (ROSPA 2010).

Research showed many intersections with older driver collisions were not regulated by traffic lights i.e. yield/give way (Davidse R, 2007). Older drivers were cited most frequently for failing to give way and for improper use of intersections. When turning during a permitted phase of signal operation, older drivers reported waiting for a large gap before making a turn therefore needing more time to react which can be frustrating for other drivers (Staplin L, Lococo K, Byington S & Harkey DL, 2001).

Malfetti and Winter (1987), in a critical incident study of older driver merging and yielding problems, reported that older drivers on freeway acceleration lanes merged so slowly that traffic was disrupted, or they stopped completely at the end of the ramp instead of attempting to approach the speed of the traffic flow before entering the mainline (Staplin L, Lococo K, Byington S & Harkey DL, 2001).

An analysis of accidents in Australasia found that the most significant contributory factor of accidents by older drivers when turning across or crossing traffic at intersections was the selection of safe gaps in conflicting traffic. Other significant causes were high task complexity and the presence of other road users, high approach speeds of conflicting traffic, high traffic volumes and limited or restricted sight distance. (Oxley, 2006). The top three design features judged to have a strong association with the crashes included:

- A lack of use of separate signals to control movements in each turn lane;
- Restrictions in available sight distances; and
- Insufficient perception-reaction time distance for intersection sight distances.

Right Turns UK, Ireland, Malta & Cyprus (Left Turns in Other EU Countries/US)

Research found right turn collisions involved mostly older adult drivers. This may be caused by a wrong judgement of the speed of the approaching vehicle, a wrong judgement of the gap needed to join the traffic flow or simply not noticing the approaching vehicle (Davidse R, 2002; Dingus et al, 1998 cited in Davidse, 2007). These are associated with functional limitations of older age such as having trouble with motion and depth perception and a decline in divided and selective attention. Older drivers had longer reaction times in comparison to younger or middle aged drivers.

Road Markings Guardrailing

Barriers and fences have been found to reduce the extent to which pedestrians attempt to cross between junctions or formal crossing points. They reduce accidents at such points and are recommended in several studies. However such barriers need careful design. Guard rails can make it more difficult for drivers to see pedestrians. (SRA, 2013)

Providing on-street parking in town centres is convenient for motorists and can slow traffic down. However, analysis has shown that cars parked at the side of the road pose a hazard to elderly pedestrians trying to cross between them. Also, vehicles reversing into parking spaces and parked vehicles which mask pedestrians attempting to cross from being seen by drivers in the stream of passing traffic, also pose a problem (SRA, 2013).

Traffic Signals (Including Pedestrian Crossings)

Older people's slower reactions, as well as their slower walking, should be accommodated in crossing design because older people tend to react at half the speed of young adults. Difficult or dangerous situations include:

- Insufficient time to cross at signalised crossings;
- Junctions where traffic may turn during a pedestrian phase;
- Fast traffic and busy roads;
- A lack of signal-controlled pedestrian crossings especially at intersections ;
- Wide roads with four or more lanes;
- Falls on footways causing slight and serious injuries, particularly for older women; and
- Poor footway surfaces, slippery surfaces caused by ice and snow (Dunbar G, Holland CA, Maylor EA, 2004).

PUFFIN crossings are widely used to provide pedestrians with a crossing time which is adapted to their speed of walking. The SaMERU research found that elderly people did not like the fact that the display indicating when to cross is not visible during the crossing, therefore it is suggested a countdown facility could be used (SRA, 2013).

Older pedestrians take too long to cross pedestrian crossings (Burgos, 2012). The assumed 'normal' walking speed of 1.2m per second is utilised internationally as the basis for pedestrian crossing timings. The results in the study by Asher (2012) show that pedestrian crossings requiring a walking speed of 0.8m per second may be more appropriate, as this would allow the 'average' man or woman over 65 years of age sufficient time to cross as shown in Table 28.

Table 18 - Average Walking Speeds

	Age	speed walk m/s	per min	per 5 mins	per 10 mins
TRL study	15-59	1.3	78	390	780
DMRB	Average	1.2	72	360	720
TRL study	60+	1.15	69	345	690
Asher	65+	0.8	48	240	480
Rún Lárusdóttir	3 to 6	0.84	50.4	252	504

WHO also reported that short duration traffic signals and wide streets also compromise the safety of less physically able pedestrians, for example frail older people or disabled people (WHO Regional Office for Europe 2004 cited in BMA 2012). It was also reported by I'DGO that pedestrian refuges (traffic islands) are not always wide enough for users, especially mobility scooters (I'DGO 2007).

In the USA 31% of older fatalities and 51% of injuries were at junctions, most were when the pedestrian was on the crosswalk and half were when the pedestrian signal was green. Only 35% of roads crossed by older persons were main roads, however 85% of injuries were on these roads. In Canada 85% of over 64 years pedestrian fatalities were in urban areas, most involving vehicles happen while crossing the road. In France 73% of those aged 65 and over pedestrian fatalities occurred while crossing.

Roads

A study by the Transport and Road Research Laboratory (TRL) (Wilson & Grayson, 1980) of the time it takes pedestrians to cross the road, discovered a number of important facts:

- The elderly, people aged over 60 in this study, delay longer at the kerb and make more head movements before crossing than do other adults, which may be a reflection of the greater difficulty they experience in assessing a traffic situation. However, the higher casualty rate for the elderly compared with other adults suggests that the additional delay and attention paid to the task are not in themselves reliable predictors of greater safety;
- The mean crossing time from kerb to kerb increased with age from 11.2 seconds under 30 years to 14.4 seconds for those aged 70 or more indicating that the elderly were exposed to traffic in the roadway for 29% more time than young adults. The mean number of head movements also increased during crossing from 3.4 per pedestrian under 30 to 3.9 per pedestrian aged over 70 or more, a difference of 15%. It is not immediately clear what effect this has on the safety of pedestrians but it could be an indication of the difficulties the elderly face in the complex task of road crossing;
- Although age differences in behaviour were found, in absolute terms they were small in magnitude and would not seem sufficient to account for the higher casualty rate of the elderly, indeed in some respects the results pointed in the opposite direction; and
- Good quality paths to local open spaces made a difference to the total time older people spent outdoors. The most important aspects of local open space to participants were safety, having appropriate facilities, trees and plants and activities to watch, good maintenance, and no heavy traffic en route (I'DGO, 2007).

Reported statistics indicate that the risk of being involved in an accident increases after the age of 70, and up to that age they are more likely to cause a crash than be a victim of another road user's mistake. However drivers over 70 and especially those over 80 years, are more likely to be at fault when they crash. Older drivers are commonly involved in collisions at junctions, often because they mis-judge the speed and or distance of other vehicles or fail to see a hazard. Visual impairment may be a factor in this type of crash (ROSPA, 2010).

For those 70 and over are more likely to be the party that causes the collision rather than the one innocently involved in it. Older drivers between 80 and 89 years appear to be four times more likely to have caused a collision than to have been involved in one (ROSPA, 2010). Over half of these collisions will occur at an intersection (FARS 1998 cited in Staplin L, Lococo K, Byington S & Harkey DL, 2001). Age related functional limitation and or impairment can influence driving performance. Drivers can compensate by avoiding difficult driving circumstances such as driving during peak hours, darkness or bad weather conditions (Davidse R, 2007).

The number of driver fatalities is higher for those over 70 years and so it is likely that increasing life expectancy will mean an increase in the number of older drivers, in turn could lead to an increase in older driver fatalities (ROSPA, 2010).

Action 3.2: Recommendations for Generic Changes or Good Practice

The number of complex highway situations should be minimised (Modena, 2013). Benekohal et al. (1992) also found that the following highway features become more important to drivers with an increase in age (with proportion of drivers responding in parentheses):

- Lighting at intersections (62%);
- Road markings at intersections (57%);
- Number of left-turn lanes at an intersection (55%);
- Width of travel lanes (51%);
- Concrete lane guides (raised channelisation) for turns at intersections (47%); and
- Size of traffic signals at intersections (42%) (Davidse R, 2007).

Design Issues

Guidance published by the National Institute for Health and Clinical Excellence (NICE) in 2007 sets out a series of generic principles that may be used as the basis for planning, delivering and evaluating activities, aimed at supporting health-related attitude and behaviour change (National Institute for Health and Clinical Excellence, 2010 cited in BMA, 2012). These recommendations may be related to older persons as follows:

- Basing interventions on a proper assessment of a target group, where they are located and the behaviour which is to be changed;
- Working with other organisations and the community itself to decide on and develop initiatives;
- Building on the skills and knowledge that already exists in the community, for example, by encouraging networks of people who can support each other;
- Taking account of, and resolving, problems that prevent people changing their behaviour
- Basing all interventions on evidence of what works;
- Training staff to help people change their behaviour; and
- Evaluating all interventions (National Institute for Health and Clinical Excellence, 2010 cited in BMA, 2012).

Among older generations, the use of public transport is affected by a number of barriers. These include concerns about personal safety, difficulty in carrying heavy loads, problems with reliability, and the behaviour of transport staff as well as other passengers. Fears about safety, such as the fear of falling, can also become a significant factor (Economic and Social Research Council, 2005 cited in BMA, 2012).

Interventions may be targeted at older pedestrians themselves, other road users and the road environment. Because older people are so vulnerable to the consequences of physical injury, there is an onus on the system designer to minimise potential conflicts between older pedestrians and vehicles through the design of the road environment. However, interventions must achieve a balance between costs and benefits. Many older people request signal-controlled crossings and central pedestrian refuges (Dunbar G, Holland CA, Maylor EA, 2004).

A number of different interventions were reviewed to illustrate the application of cost–benefit analysis to evaluations of these changes. Reductions in pedestrian accidents were given by roundabouts, by upgrading pedestrian crossings, and integrated area-wide speed reduction (PROMISING, 2001 cited in Dunbar G, Holland CA, Maylor EA, 2004).

It is thought that there is also a need to educate drivers to better understand vulnerable road users such as driver behaviour at intersections, pedestrian crossings, when turning or manoeuvring, moderate speed when near vulnerable road users (Dunbar G, Holland CA, Maylor EA, 2004). A number of key documents for this workpackage have been outlined below.

The Design of Streets with Older People in Mind

The I'DGO Project has developed a 13-part toolkit based upon the research undertaken by the SURFACE Inclusive Design Research Centre at the University of Salford during both phases of I'DGO and also in partnership with the Centre for Health Sciences Research. Twelve parts were published in 2007 and a further document in 2012. Each guide is presented in three parts as follows:

- A summary of existing UK guidance relating to the design of the environmental feature;
- What I'DGO found from surveys and street audits; and
- Recommendations for the inclusive design of the environmental feature.

The full list of guides is as follows:

- DSOPM001: Seating – first published 2007 and updated in September 2012;
- DSOPM002: Bus Stops and Shelters - first published 2007 and updated in September 2012;
- DSOPM003: Tactile Paving – first published 2012; and
- DSOPM004: Pedestrian Crossings - first published 2007 and updated in June 2013.

There are also guides on the following:

- Width
- Adjacent and shared use (cyclists and pedestrians)
- Materials
- Changes in Levels
- Kerbs
- Signage
- Public Toilets
- Street Art
- Street Greenery

Design Manual for Roads and Bridges (DMRB)

This document is the standard design manual used by Highway Engineers in the United Kingdom. The manual gives the requirements of the overseeing highways organisations of England, Scotland, Wales and Northern Ireland in respect of quality management systems applicable to the design of highways including construction and maintenance works. It provides interpretation and guidance on ISO 9001:2000 for highway designers including advice on the development and use of competence management systems.

Specific reference is made to the need to consider elderly road users in the DMRB volumes regarding audits, traffic calming, design consultations, pedestrians, cycle routes and non motorised units (NMU's) which includes mobility scooters. The guidance asks the designer to consider the needs of the elderly (and other vulnerable road users) but does not generally explain the difficulties that they face.

The DMRB Volume 5 (DfT (1992)) regarding NMU's does seek consideration of various types of disability that can be relevant to the elderly eg mobility impaired, visually impaired, hearing impaired, people with reaching, stretching and dexterity problems and people with learning disabilities. However, the design requirements for these people do not appear to be included in the main volumes.

In DMRB Volume 5 (DfT (1992)) it states that approximately 14% of the population have physical, sensory or mental impairments that cause mobility difficulties. Many people, particularly older people, have more than one impairment. Able bodied people also encounter temporary mobility impairment, for example when pushing a baby's buggy, carrying shopping or luggage and escorting children.

Disabled people have a range of specific needs, in terms of manoeuvrability requirements regarding gradients, ramps and steps, barriers, colour contrast, surfaces, kerbs, crossings and access to public transport. Disabled people have particular difficulties crossing busy roads such as trunk roads. It is usually possible to accommodate the needs of most pedestrians by providing for disabled people. Therefore, meeting the needs of disabled people should be a fundamental part of the design process.When reviewing a NMU crossing site assessment for local site characteristics, the crossing site assessment record sheet includes the surroundings including if there is an older persons and/or disabled persons residential home within 100 metres. Data for crossing traffic information, the time to cross the road, difficulty crossing, latent crossing demand, all include the consideration of disabled people or older people.

However, some DMRB documents such as those considering minor highway improvements and large signal controlled junctions do not include references to the needs of the elderly.

In DMRB Volume 5 reference is made to the document 'Inclusive mobility' (DfT, 2005). However, it is only included as a reference to the document and because it is not 'mandatory' may not be given the consideration it deserves.

Inclusive Mobility (DfT, 2005)

This document provides design guidance for people with different types of disability and is useful for any designer of the highway environment. Part III of the Disability Discrimination Act 1995 (DDA) – (now covered by the Equality Act 2010) -gives disabled people a right of access to goods, facilities, services and premises. These requirements apply to facilities and services in the pedestrian environment and in transport related infrastructure: bus stations and stops, airports and rail stations.

The guidelines do not have any legal status and compliance with them should not be regarded as complying with the Equality Act, but they provide guidance on established best practice in a general sense that relevant organisations may apply to their particular situation.

Although the main purpose of these guidelines is to provide good access for disabled people, designs that satisfy their requirements also meet the needs of people with small children, people carrying heavy shopping or luggage, people with temporary accident injuries and older people.

The overall objective of the guide is to provide inclusive design and therefore contribute to social inclusion.

The guidance encourages access audits that can provide detailed analysis of potential and actual problems. See the sections on Mediate and Isemoa. The guidelines encourage audits to take into account disabilities such as sensory and cognitive impairments.

The term disability is a broad one. It includes people with physical, sensory or mental impairment. At a conservative estimate, 12 - 13% of the population have some degree of impairment. Many, though not all, face barriers to movement in the environment. This guide is intended to show how these barriers may be removed or at least reduced, but it does have a wider relevance because there are many other people, not conventionally considered to have a disability, but who also encounter barriers to movement.

In functional terms the guide is mainly concerned with the following types of disability:

- Locomotion - including people who use wheelchairs and those who walk with difficulty, often using some form of aid such as a stick or walking frame. Nearly 70% of disabled people have locomotion difficulties; those with walking difficulties outnumber wheelchair users by about 10:1;
- Seeing - this can be sub-divided into blind and partially sighted people. It is estimated by the Department for Work and Pensions (DWP) that there are almost two million people in Great Britain with a significant sight loss;
- Hearing - can also be sub-divided into those who are profoundly deaf and those with impaired hearing, ranging from severe to mild deafness. The Royal National Institute for Deaf People (RNID) estimates that there are over eight million deaf or hard of hearing people in the UK of whom approaching 700,000 are severely or profoundly deaf;
- Reaching, stretching and dexterity - frequently the result of arthritis, which can make these movements painful and difficult, or of muscular dystrophy causing a loss of muscular strength, or of complaints of the nervous system; and
- Learning disability - making it hard to understand complicated information or to use complex machines (like some ticket machines).

These categories are not mutually exclusive as many disabled people, particularly older people, have more than one impairment. The following paragraphs give some basic information on the space needed by people when they are standing or moving. Of course there is a lot of variation in this, but if the dimensions given below are used then the great majority of disabled people will be able to move around buildings and the environment much more easily.

Recommended walking distances without a rest are provided, for example how the mobility impaired using a stick may need to rest after 50 metres or if they are mobility impaired but are without a walking aid they may need a rest after 100 metres. This all goes to support the provision of seating at regular intervals along highways. Reference is also made to how some people find standing difficult and painful, particularly those with arthritis, rheumatism and back problems which tend to be more prevalent amongst older people.

Mobility Impaired and visually impaired people - this section provides a great deal of detail regarding the dimensions that footways and passages need to be to accommodate someone using a walking aid, such as a stick or crutches or a wheelchair and mobility scooters. Details are also provided of the actual dimensions of various types of wheelchair and the space required to turn using such aids; as well as dimensions associated with comfortable and extended reach ranges.

Footways, footpaths and pedestrian areas information regarding appropriate dimensions is provided for different categories of disabled users e.g. with wheelchairs such as required spaces at bus stops, gradients that different people can manage, details of height and colour contrasts for fences, guardrails and seating (recommended every 50 metres), street furniture and the importance of the consistent use of posts, poles and bollards and in particular, waste bins, bollards, flower beds, colour contrasts, streetworks management, the quality of surfaces with paving slabs, gratings and slip resistance.

This section also raises other issues:

- Temporary obstructions such as A-frames - advertisement boards placed outside shops, dustbins, vehicles, bikes;
- Road Crossings – reference is made to the need to consider whether there is a hospital, sheltered housing or workshop for disabled people within 100m of the crossing. It considers extended timings for pelican, PUFFIN and toucan crossings and central refuges with wheelchair users in mind;
- Dropped kerbs;
- Raised crossings;
- Pedestrian guardrailing;
- Tactile paving and other hazard warning surfaces;
- Car parking including parking bays - parking vehicles partly on the pavement is one of the main causes of concern to blind and visually impaired people, deaf blind and partially sighted people in the pedestrian environment. Prevention such as enforcement;
- Parking control equipment;
- Bus Stops - recommends every 400 metres; however it does mention the provision of stops every 200m due to evidence that bus use by disabled persons fall if the distance between bus stops is more than 200m;
- Bus Stop Design - shelters, bus stop flags, seating, timetable information (includes details of visual displays that are useful for deaf and hard of hearing);
- Taxi ranks;
- Building design - features like ramps, stairs, lifts, lighting, railway stations (including ticketing services, phones);
- Toilets; and
- Signage and Information - signage should include distances to facilities because this can be critical for people with any mobility issues.

DfT Shared Space 2011 LTN/1/11

This Local Transport Note (LTN) focuses on shared space in high street environments, although many of its principles will apply in other settings. Shared space can be defined as a street or place designed to improve pedestrian movement and comfort by reducing the dominance of motor vehicles and enabling all users to share the space rather than follow the clearly defined rules implied by more conventional designs. It places particular emphasis on stakeholder engagement and inclusive design - research carried out specifically to inform the preparation of this LTN.

Mobility (DfT, 2002) (reference to Inclusive Mobility – a Guide to Best Practice on Access to Pedestrian and transport Infrastructure):

- Well maintained, even surfaces free from clutter and obstructions significantly influence comfort levels of people with impaired mobility. Ambulatory people with impaired mobility often need regular opportunities to rest;
- Mobility impaired people often find using a surface with a pronounced crossfall difficult. Along pedestrian desire lines, a crossfall of between 1% and 2% is preferred and 2.5% should be regarded as the maximum in most cases;
- The design team – shared space schemes tend to have wide ranging objectives beyond more traditional single issue e.g. road safety traffic management schemes. It is therefore essential to assemble a multi-disciplinary project team which includes accessibility/mobility specialists; and
- When mobility officers are employed in an area it might be worthwhile approaching them with a view to their providing familiarisation training for blind and partially sighted people when the scheme opens. Such training can be particularly helpful to those who may be initially concerned about using the street in its new form.

Older

- Where corduroy paving is used as a delineator, it should change to blister paving at crossing points. Blister paving should not be used as a general delineator because of its specific meaning of indicating a crossing point. In addition, over-use of blister paving may create instability issues for some users, particularly disabled or older people;
- Comfort Space – An area of the street predominantly for pedestrian use where motor vehicles are unlikely to be present. Comfort space is of particular benefit to disabled people and older people, but it is especially important for blind and partially sighted people, and it needs to be designed with needs in mind. Delineation might range from a tactile strip to say a row of bollards every few metres; and
- Seating is best situated in well overlooked locations. It is of particular benefit to disabled people, older people and people carrying heavy shopping. Inclusive Mobility recommends seating at intervals of no more than 50 metres in commonly used pedestrian areas. Advice on seating is also available in a seating design guide published by I'DGO(Inclusive Design for Getting Outdoors) available at www.idgo.ac.uk/design_guidance/streets.htm (2013).

Although disabled and older people are likely to prefer conventional seating, other opportunities to rest can be provided less formally, such as bespoke seating, low walls, or other street furniture. This can be designed to integrate well with litter bins, creating an attractive uncluttered environment.

Disability

The document defines the 5 types of disability:

1. Mobility Impairment - includes people who walk with some form of aid such as a stick or walking frame and those who use wheelchairs;
2. Visual Impairment - about 2 million people in the UK have some form of visual impairment, around 95% have a degree of residual vision highlighting the importance of tonal contract in aiding navigation;
3. Hearing Impairment - hearing loss ranges from mild to profound deafness. Around 10% of people with hearing problems are profoundly deaf. Deaf people can have balance problems which can create difficulties for them on surfaces with a pronounced crossfall;
4. Cognitive Impairment - this includes people with learning difficulties, those who have acquired cognitive impairment with age, mental health problems, all of whom may find street environments challenging. Some may experience difficulties in recognising where

they are, even in their local environment. Legibility of the street is therefore an important component of design, and reducing clutter can help in this respect; and

5. Wheelchair inconsiderate parking may result in vehicles encroaching on the space, which may prevent wheelchairs getting through. Street furniture can be used to protect the footway from parking and loading in a level surface scheme.

Pedestrian Areas (No Access, or Limited Access for Vehicles)

The European project I'DGO found frequent, warm, supportive seating is important in detailed design. Some form of seating should be provided at 100m intervals on streets; less than 100m if the neighbourhood is hilly. Seating needs to be located in an appropriate position and details of the locations should consider such factors as not being an obstruction, where people would want to sit, and a well lit place, with good sightlines away from sources of noise and air pollution.

There would need to be room for a wheelchair or mobility scooter to pull up alongside a seated companion. The seating should be of a design that should be warm, comfortable and easily maintained. It should also have arm rests and a back and be at a comfortable height for people who have difficulty bending their knees (I'DGO, 2012). Also, older pedestrians should benefit from benches and shelters provided along frequently walked routes, e.g. between shops and residential areas (FEPA, 1995 cited in Dunbar G, Holland CA, Maylor EA, 2004).

In order to reduce clutter and difficulties for older pedestrians, signalling apparatus needs to be positioned in conjunction with other street furniture and signal poles should be treated as an element of street furniture to ensure a comprehensive approach is adopted across all schemes. Signal cabinets should be located where they will cause minimal obstruction (Southend Streetscape Guide, 2013).

Footway pavement and open spaces should be well-maintained and the paths should be easy to walk on, enjoyable and without barriers (I'DGO, 2007). Concerns regarding some design aspects of Home Zones, such as catering for less able bodied members of the community have been raised. Single surface areas have benefitted those with mobility problems, but this design can disadvantage the partially sighted, where no guidance is given. Therefore, boundary features have had to be incorporated into the design to provide some guidance for those with sight problems (Barrel and Whitehouse, 2004 cited in York I, Bradbury A, Reid S, Ewings T and Paradise R, 2010).

Shared Surfaces (Vehicles, Cyclists and Pedestrians)

Stakeholders suggested that if policy moved towards safer shared surface environments by reducing vehicle conflict it would allow for more informal crossing points and would benefit all pedestrians. They also suggested the follow actions:

- Investigate how urban areas may become more pedestrian friendly to incorporate informal crossing points;
- Educate drivers (especially bus drivers) to be more aware of pedestrians, particularly at crossings as well as to be considerate of elderly passengers (allowing more time i.e. to get on a bus and take a seat before moving off);
- Encourage pedestrians to use formal and informal crossing facilities; and
- Investigate the potential to improve design features at crossings to ensure easy use i.e. zebra crossings - incorporate audible and improved lighting features, countdown systems. Provide more on road facilities for cyclists.

Access to buildings and public space is an important function of streets and pedestrian access should be designed for people of all ages and abilities (DfT, 2007). Designs must recognise the importance of way-finding and legibility, especially with regards to the sensory and cognitive perceptions of older people and disabled people - an inclusive environment that recognises the needs of people of all ages and abilities (DfT, 2010).

Street design faces a dilemma of how to improve aesthetics by providing parking away from houses and yet still allowing access for those who need it, especially vulnerable groups, notably elderly and disabled people. Older persons highlighted how hard it was to travel around the street using 'other' modes of transport. Non-motorised users with specific needs should be considered in street design, in particular those with mobility constraints and older people (York I, Bradbury A, Reid S, Ewings T and Paradise R, 2010).

Footway parking (also called pavement parking) causes hazards and inconvenience to pedestrians, particularly blind or partially-sighted people, disabled people and older people. It is therefore recommended that footway parking be prevented through the design of the street. It is possible to deter footway parking through physical measures, such as by installing bollards, raised planters or other street furniture, and by clearly indicating where people should park (DfT, 2007). It is important to prevent pavement encroachment by heavy vehicles that may cause damage (uneven surfaces) for older pedestrians. High contrast markings on obstacles on footways such as on the kerb is also recommended to aid older persons (Tinetti ME, 2001 cited in Dunbar G, Holland CA, Maylor EA, 2004).

An island at the middle of a crossing allows an older pedestrian to tackle a two-lane road one part at a time and thus reduce risk. However, there have been reports that some older people express anxiety about becoming stranded at a refuge. Placing barriers and re-routing pedestrians will reduce conflicts but may create difficulties if the alternative routes are inconvenient. It is thought relatively unlikely that older pedestrians would be persuaded to use footbridges. This needs to be borne in mind when designing facilities (Dunbar G, Holland CA, Maylor EA, 2004).

A review of the road safety of the disabled recommends for those with hearing impairments:

- Pelican crossing with visual cues; and
- PUFFIN crossings are beneficial as green/red man signs are on the same side as pedestrians.

A review of road safety for those with visual impairments highlights:

- Widespread use of tactile paving to indicate crossing points;
- Adopting standards for footways that incorporate 'unobstructed widths';
- Coloured pavements (such as home zones) should be avoided because it may be difficult to see where the carriageway starts or may create an illusion of obstacles in path;
- Street corners with kerb flush with the carriageway on the radius can be hazardous because people may find it difficult to line themselves up with the opposite carriageway (Williams K, Savill T, Wheeler A, 2002 cited in York I, Bradbury A, Reid S, Ewings T and Paradise R, 2010).

Interventions to reduce older pedestrian accidents:

- Shortening crossings by the use of refuges and median strips, or by "build out" of pavements at crossings (narrowing the road); and

- Consideration to the design of pedestrian crossings - issues such as signalling, provision of central refuges, and the siting of crossings, in relation to junctions for example, can affect the safety of a crossing (DUMAS, 1998).

Following the Southend improvement schemes, Urban Movement (2011) advised that, what is best practice in one location will not necessarily be appropriate in another location. However, there is an increasing body of reliable UK evidence indicating that removing barriers to walking in busy, mixed use urban streets does not make them less safe for older pedestrians.

Research from Sweden has suggested that to ensure public transport is accessible to all, it is necessary to provide:

- Mainstream public transport services (road and rail) which are accessible to people in wheelchairs, those with other impairments and elderly people;
- Service routes that use accessible low-floor entrances, especially on routes close to housing for elderly and disabled people, health facilities, shopping, and other common destinations;
- Accessible taxi services with user-side subsidies to assist older travellers and those with mobility limitations; and
- Door-to-door services such as dial-a-ride, community buses, and voluntary car services for passengers who need assistance from house to vehicle, during travel, or at their destination (Transportation Research Board, 2009 cited in BMA, 2012).

Footways (Adjacent to Carriageways)

Stakeholders suggested that improving the quality of footpaths and road surfaces at crossing points would be beneficial. Educational intervention could encourage cyclists to take more care on shared surfaces. This could also be extended to those who use mobility scooters and also inform drivers about the unsafe outcomes of parking on pavements. Parking enforcement measures could also eliminate inconsiderate parking on footways as discussed in the previous section. It has been recommended that the adoption of a safe system approach for the design of the walking environment should be organised in such a way that specific risk groups are not exposed to avoidable risks (International Transport Forum, 2011). There should be an assurance that local transport plans and proposals for urban development and regeneration support physically active travel, including prioritising the needs of pedestrians and cyclists over motorists (BMA, 2012). This should ensure pavements are maintained to a high standard and wider pavements are provided to accommodate all users. It should also be noted that control of vegetation would facilitate all pedestrians especially visually impaired people who have reported problems with overhanging objects when walking (Gallon et al.1995 cited in Dunbar G, Holland CA, Maylor EA, 2004).

Oxley (2010) noted in a review of issues for elderly pedestrians that the 'ergonomic' requirements of older pedestrians who have difficulty walking may be addressed by careful positioning of resting places, the amount and height of steps, slope of ramps, kerb height, pavement width and maintenance of pavements. The improvements in the street scene in St Annes in Lancashire provide a good example of how such measures result in a walking environment that is attractive for all (SRA, 2013). The I'DGO found that, in terms of detailed design, the following features are important; sufficient bus stops with weather protection and seating (I'DGO, 2007).

Improving the quality of footpaths and road-crossing surfaces is therefore an important aid to pedestrian safety and mobility to help counteract the tendency of older people to look down

(SRA, 2013). I'DGO found that in terms of detailed design, the following features are important: wide and flat tarmac footways, easy transition at level changes, unobstructed navigation (I'DGO, 2007). In urban areas, half-batter kerbs with a high standard height of 125mm are often used, but lower kerb heights are easier for pedestrians to negotiate, particularly people with impaired mobility, and may help to reduce vehicle dominance by reducing the degree of segregation (DfT, 2010).

The DfT recommends that cyclists should be catered for on the carriageway if at all practicable. If cycle tracks are provided, they should be physically segregated from footways/footpaths if there is sufficient width available (a minimum combined width of about 3.3m). The fear of being struck by cyclists is a significant concern for many disabled people. Access officers and consultation groups should be involved in the decision-making process (DfT, 2010).

Traffic Signs

I'DGO found that in terms of detailed design, the following features are important: clear, simple, easily visible and understandable signage (I'DGO, 2007). Clear signage should be provided to warn motorists of vulnerable road users crossing (including pedestrians and cyclists) (Modena, 2013).

The US Highway Design Handbook for Older Drivers and Pedestrians states that oneway and give way signing needs to be more conspicuous through the provision of multiple or advance signs as well as placing signs in the drivers' field of vision and using signs larger in size and have a higher level of retro reflectivity (Staplin L, Lococo K, Byrington S & Harkey DL, 2001 cited in Davidse R, 2007). Refer to WP2 by the Technical University of Dresden (TUD) for further details. Also, the need for traffic signals to be more visible to all highway users has been identified, particularly to avoid the risk of the signals being obscured by lorries (Burgos, 2013).

The US Highway Design Handbook for Older Drivers and Pedestrians recommends the following:

- To accommodate the reduction of visual acuity associated with increasing age, a minimum letter height of 150mm is recommended on post-mounted street signs on all roads where the posted speed limit exceeds 40 km/hr, a minimum of 200mm uppercase at major intersections, 150mm lowercase at speeds 56km/hr or less and a minimum of 250mm uppercase at major intersections and 200mm lowercase at speeds over 56km/hr;
- A stop ahead sign is recommended to be used where the distance at a stop sign is visible less than the required stopping sight distance at the operating speed ; and
- Signs should be mounted overhead wherever practical (Staplin L, Lococo K, Byington S & Harkey DL, 2001).

Road design elements can anticipate difficulties faced by older drivers by providing appropriate placement and legibility of traffic signs e.g. street-name signs, conspicuousness of obstacles e.g. kerbs, medians and traffic islands, and recognisable intersection control (who has right of way) and lane assignment (Staplin L, Lococo K, Byington S & Harkey DL, 2001 cited in Davidse R, 2007).

Intersections

Stakeholders suggest the investigation of alternatives to tactile paving at intersections (identified as uncomfortable surface to walk on or a trip hazard) as well as suggesting the need to review design features of intersections to reduce vehicle and pedestrian conflict.

It is important to note that because older drivers generally have restricted head and neck mobility, they will have more trouble with intersections where streets meet at a small angle; the optimum angle being one of 90 degrees. A right angle junction is important for older road users (Davidse R, 2007).

An infrastructure that takes account of functional limitations of older people means the infrastructure allows the driver enough time to observe, decide and act. Intersection design elements fit the most important needs for assistance as well as taking into account older drivers' increased sensitivity to glare, reduced colour contrast sensitivity, colour vision and divided attention (SWOV, 2002 cited in Davidse R, 2007). Table 29 summarises functional limitations and the relevant road design elements.

Table 29 - Road Design Elements

Functional limitations	Relevant factor	Relevant road design elements
Peripheral vision and flexibility of head and neck	Quality of the information	Angle at which streets meet
Night-time visual acuity and sensitivity to glare	Quality of the information	Fixed lighting Design of traffic signals
Contrast sensitivity and motion perception	Quality of the information	Assistance for turning left Contrast of pavement markings Design of traffic signs and signals Design of street-name signs
Colour vision	Quality of the information	Design of traffic signs and signals
Divided attention	Number of decisions	Type of intersection (roundabout)
Selective attention	Amount of information	Placement of traffic signs
Speed of information processing, divided attention, and performance under pressure of time	Time pressure	Angle at which streets meet Lane-use control signs Type of intersection (roundabout) Placement of traffic signs Fixed lighting

As older people need more time to react (increase perception-reaction time) at smaller angle intersections they will probably have more adverse consequences for older drivers than for younger drivers. Traffic designers can resolve this by using longer perception-reaction time (prt) when calculating sight triangles and stopping distances with a minimum prt of 2.5 seconds (CROW, 1998, Staplin L, Lococo K, Byrington S & Harkey DL, 2001 cited in Davidse R, 2007). It has been suggested that the following three characteristics of intersection design should be considered by designers:

- Elements that provide good and early view of the intersection;
- Elements that assist the driver in making a right turn; and
- Roundabouts (Staplin L, Lococo K, Byrington S & Harkey DL, 2001 cited in Davidse R, 2007).

Other factors for consideration in terms of intersection design are as follows:

Visibility:

- Careful positioning of bus stops in relation to junctions can increase visibility of pedestrians by decreasing the number of people entering the road in front of a stopped bus (SRA, 2013).
- Parking near the junction should be reduced to improve visibility for pedestrians and vehicles (Burgos, 2012).

Layout :

- Road signage needs to be unambiguous to ensure drivers know which lane they should be using to proceed in a certain direction (Burgos, 2012).
- Improved intersections to reduce vehicular speed (Burgos, 2012).

Crossings:

- Controlled crossing points are an important consideration in detailed design (I'DGO, 2007).
- Pedestrian desire lines should be established and traffic calming schemes examined from a walking perspective. (DfT (1992)).
- Pedestrian crossings with lights submerged in the footway utilised in Burgos (2012) may help guide elderly people who tend to look down when walking to avoid trips and falls.

Roundabouts:

- Roundabouts were found to reduce the number of collisions (Elvik R, 2003, Van Minnen J, 1990 cited in Davidse R, 2007) and lower speeds also reduce severity of crashes which would be beneficial to older road users (Robinson EW et al, 2000 cited in Davidse R, 2007).
    - Recommended to limit to one lane entrances and exits and one lane of circulating traffic with the inscribed circle diameter limited to approx 30m;
    - Recommended that pedestrian crossings at single-lane roundabouts be set back to a minimum of 7.5m behind the yield line;
    - To control wrong way movements, traffic calm and provide a pedestrian refuge for all roundabout categories it is recommended that raised splitter islands are used to delineate channelisation, the pedestrian crosswalk should be designed at street level (cut through splitter island); and
    - Recommended that sides and tops of kerbs on splitter islands and central islands to have retroflective markings with a minimum in-service luminance contrast of 2.0 or higher is recommended at intersections with overhead lighting and contrast of 3.0 or higher at intersections without overhead lighting;
- Traffic control devices and physical layout and appearance of roundabouts should be uniform to give older drivers the opportunity to gain experience with roundabouts and develop a mental schemata for managing roundabouts, to safely negotiate roundabouts in their own town and also those in another town (Wouters PIJ, Slop M, Lindeijer JR, Kuiken & Roendersloot L, 1995 cited in Davidse R, 2007); and
- Older drivers prefer single-lane roundabouts to multi-lane roundabouts (Mesken J, 2002 cited in Davidse R, 2007). The application of multi-lane roundabouts is a matter of capacity needs, the alternative is the signalised intersection which is generally less safe.

Measures should focus on reducing the complexity of intersections, particularly where safe gap selection is critical, reducing vehicle speeds approaching intersections, reducing the requirement for extensive sight distances and allowing the time needed to take in information about the traffic, make a decision and respond. The provision of stop and give way signs and fully controlled right turn signals can help (Oxley, 2010). Oxley found that roundabouts can particularly help older drivers but conversely this does not help older pedestrians nor where space is limited as in many of the historic towns in Europe.

Given gap selection is a significant issue at intersections for older drivers the findings of this report provide strong support for the introduction of fully controlled turning signals to assist older drivers to make safe right turns. Introducing a safer environment for older road users will also provide a safer road environment for all aged road users (Oxley, 2006).

The US Highway Design Handbook for Older Drivers and Pedestrians recommends the following:

- Use of barrier kerbs as opposed to sloping kerbs except at pedestrian refuge areas or areas being used for access control;
- Use of pedestrian refuge islands;
- The implementation of signs (Divide Highway Crossing, Wrong Way, Do not Enter, Keep Right and One Way) at intersections should be oversized to provide high retroreflectance at the widest available observational angles to provide increased sign conspicuity and legibility for older drivers;
- Retroflective lane-use arrows and pavement markings are recommended ;
- A minimum in-service luminance contrast of 2.0 or higher is recommended at intersections with overhead lighting and contrast of 3.0 or higher at intersections without overhead lighting;
- When it is necessary to accommodate turning movements by heavy vehicles, the use of offset, tapers and compound curves is recommended to minimise pedestrian crossing distances;
- To reduce confusion the use of a separate signal face to control turning phase (versus through) movements is recommended for all operating modes; and
- Consistent post of lane-use control signs plus application of lane-use arrow pavement marking at a preview distance of at least 5 seconds in advance of a signalised intersection is recommended (Staplin L, Lococo K, Byrington S & Harkey DL, 2001).

Right Turns UK, Ireland, Malta and Cyprus (Left Turns in Other EU Countries)

Right turn collisions involving older adult drivers may be caused by a wrong judgement of the speed of the approaching vehicle, a wrong judgement of the gap needed to join the traffic flow or simply not noticing the approaching vehicle (Davidse, 2002; Dingus et al., 1998 cited in Davidse, 2007). These are associated with functional limitations of older age such as having trouble with motion and depth perception and a decline in divided and selective attention. To reduce confusion, current guidelines recommend the use of a separate signal for each lane of traffic (CROW, 1998 cited in Davidse, 2007). The length of the clearance interval should allow for the slower processing of information to leave the intersection area after the amber phase before conflicting streams of traffic arrive (CROW, 1998; Staplin, Lococo, Byington & Harkey, 2001 cited in Davidse, 2007).

Adjusting right turn lane geometry can possibly improve safety. Restricted sight distances (traffic using opposite right-turn lanes can restrict the right turning drivers' view of on-coming traffic in through lanes) can be minimised or eliminated by shifting opposite right-turn lanes to the right so right-turning drivers do not block each other's view of oncoming traffic (Staplin, et al., 1997 cited in Davidse, 2007). Where this is not feasible computing the sight distance using a perception-reaction time of 2.5 second to allow for the slower processing of older adults (Davidse, 2007).

Road Markings , Guardrailing

Stakeholders request the review of road markings, in particular, at roundabouts. It has been noted that arrow pavement markings are liable to wear and are less visible in bad weather. Difficulties with vehicles stopping and covering markings at the intersection have also been noted. Overhead lane use control signs in advance of the intersection would supplement pavement markings.

Drivers should be able to read signs at least 5 seconds in advance of the intersection (50mph) (Staplin, Lococo & Byrington, 1998 cited in Davidse, 2007). Older drivers need a higher contrast between pavement markings and carriageway to be able to see markings and have enough time to act upon them (Staplin et al., 2001 cited in Davidse, 2007). This also applies to discontinuities such as kerbs of traffic islands and medians, otherwise this may result in the older driver running over them (Staplin et al., 1997; Benekohal RF, 1992; Staplin, Lococo & Sim, 1990 cited in Davidse, 2007). Assisting the Older Driver thesis recommended a minimum in-service contrast level of 3.0 between the painted edge of the carriageway and the road surface for intersections without overhead lighting. For intersections with overhead lighting a minimum in-service contrast level of 2.0 is sufficient. Also all kerbs at intersections (including median islands and other raised canalisation) be delineated on their vertical face and at least a portion of the top surface. Vertical surfaces should be introduced by cross-hatched pavement markings (Staplin, Lococo, Byington & Harkey, 2001 cited in Davidse, 2007).

The Highway Design Book for Older Drivers recommends the use of transverse pavement striping or rumble strips upstream of stop-controlled intersections where engineering judgement indicates a special need due to sight restrictions, high approach speeds or a history of ran-stop-sign crashes (Staplin, Lococo, Byrington & Harkey, 2001).

Guardrailing may be used as a way of controlling the use of footways by preventing pedestrians stepping into the highway and from cars encroaching footways. The use of guardrailing however raises other safety and accessibility issues. There has not been sufficient time to research this particular highway feature in sufficient detail and it is recommended that more research be undertaken to assess its use.

Traffic Signals (Including Pedestrian Crossings)

Stakeholders indicated that education on crossings and facilities such as tactile cones would be advantageous to older persons and those with disabilities. Other suggestions included:

- Improve knowledge of how tactile cones and PUFFIN crossings work;
- Review policy to give PUFFIN crossings with on crossing detectors preference over pelicans and zebras;
- Review crossing times at formal crossing points; and
- Provide wider pavements to accommodate mobility scooter users waiting to cross.

As suggested by the stakeholders, it has been recognised by DfT that older people and people with a visual impairment may express a preference for signalised crossings as they provide greater certainty when crossing (DfT 2010). Beuret's research also found that those with disabilities prefer zebra crossings to pelican and PUFFIN crossings but in general the most preferential crossing is the pelican crossing (green man opposite crossing) (SRA, 2012).

An alternative to a crossing at road level is to separate pedestrian crosswalks physically, using a subway or footbridge. This prevents conflict from occurring and spares traffic flow. However, older people typically dislike such arrangements because of the extra physical difficulty of climbing up steps, or feelings of insecurity. According to DUMAS (1998), they see them as barriers to mobility. Stevenage New Town built major roads on embankments so that underpasses were at ground level with no slopes for pedestrians (Mitchell, 2002).

As advised previously, older drivers with reduced visual functions need more contrast, a higher level of background luminance and larger letter sizes (Olson, Sivak & Egan, 1983 cited in Davidse, 2007). Also, older adults need more time to act (turning into a street) after receiving directional information e.g. street name the placement of the sign is also important to give sufficient time to prepare and execute their actions – i.e. using advance street name, signs to improve visibility of major roads and grade separated junctions with directional arrows to accompany them (Staplin, Lococo, Byrington & Harkey, 2001 cited in Davidse R, 2007). Burgos reported measures to advise the driver in advance that there was a crossing by installing signs, crossings raised to encourage vehicles to brake before arriving at the crossing and other small speed humps were introduced at the entry/exit to the roundabout (Burgos, 2012).

Older drivers' need for increased levels of luminance and contrast should be weighed against their sensitivity to glare. Background plates provide more contrast between the traffic light and its direct surroundings without increasing the risk of blinding, they compromise between lighting, contrast and glare and an alternative to increased intensity of light. The effect of glare can be further mitigated by reducing the intensity of traffic signals during darkness, except when this is unnecessary or undesirable because of the fixed lighting of the surroundings (Davidse R, 2007).

Signal Timings/ Phasings

The results in the study by Asher (2012) show that pedestrian crossings requiring a walking speed of 0.8m per second may be more appropriate, as this would allow the 'average' man or woman over 65 years of age sufficient time to cross.

Reviewing signal times, especially at off peak times, was highlighted as an effective measure as part of the Victoria scheme, enabling sites to be identified where older pedestrians can be given longer to cross without adversely affecting vehicle delays. Trials of pedestrian countdown timers are currently taking place at a few sites in London, which may offer another solution both at signal controlled junctions and at PUFFIN crossings. These have the advantage that the remaining time can be seen throughout the period when the pedestrian is crossing. Analysis during the trial has indicated no serious increase in risk (Earl, 2011). Interviews with users found that most people preferred it to standard crossings; 83% of those interviewed and 94% of mobility impaired pedestrians liked them, and it was preferred by 69% of mobility impaired pedestrians. In addition, 71% of mobility impaired pedestrians felt safer with PCaTS (Pedestrian Count down at Traffic Signals). Fewer pedestrians reported feeling rushed when crossing the road, despite a reduction in 'green man time' (SRA, 2013).

As well as signal timing, the uniformity of crossings along common routes is also important. Older people are particularly compromised by unexpected movements of vehicles. There needs to be consistency of operation and phasing, particularly in complex scenarios such as crossings at junctions, so that accurate anticipation is made possible. Innovations such as this would increase the comfort of slower walkers at crossings.

Another approach would be to help older people anticipate the green phase as it tells pedestrians how many seconds there are until the end of the green phase. Belanger-Bonneau et al. (1994; cited in Van Houten & Malenfant, 1999) evaluated countdown signals during the green phase. Although there was no measured safety improvement, older pedestrians reported feeling more secure.

In Enschede, some older pedestrians were given a portable switch they could use to double the length of the green phase at crossings (Municipality of Enschede, 1992; cited in Hummel, 1999). A survey of users found the device was regularly used, and 70% said it allowed them to use routes they would not otherwise be able to follow. Allowing more time at signalised crossings is likely to increase feelings of security, and in this case increased mobility (Dunbar, Holland, Maylor, 2004).

Other Features

- People-detectors on crossings can adjust the length of phase to match the walking speed of the pedestrian;
- Improving the visibility of pedestrians and of traffic by using running lights is cost effective and benefits road users in general (Dunbar, Holland, Maylor, 2004);
- Signal improvements to clarify when it is safe for vehicles to cross the junction or turn right (Burgos, 2012);
- The wider research evidence also suggests that one of the most effective measures is reducing the width of crossing points (central reservation, build outs, etc.) and speed reduction. In some situations a good compromise between this need and the management of motorised traffic is the combined use of a PUFFIN crossing which has on crossing detectors with additional count down facilities (SRA, 2013);
- A countdown system on the signalised pedestrian crossing for vehicle and pedestrians (Burgos, 2012);
- Recorded spoken reminder to watch for turning traffic at a signal-controlled crossing could reduce vehicle and pedestrian conflict (Dunbar, Holland, Maylor, 2004);
- Zebra crossings should be signalised on distributors (Modena, 2013);
- Evidence shows that refuge islands are especially helpful to pedestrians who walk at slower speeds – Retting et al's (2003) (SRA, 2013) evidence found significantly lower pedestrian casualties on multi-lane roads with raised medians than those without;
- Enhancements such as positioning formal crossing points to coincide with pedestrian desire lines and raising crossings so that drivers have to slow down to approach them are measures identified in a review of factors influencing safety of pedestrians (Martin, 2006) which would be expected to have particular benefits for elderly people;
- An inexpensive intervention at signal-controlled junctions is to reposition stop lines further back from the crossing, making drivers stop further back, giving pedestrians more space and at the same time making them easier to see. This is particularly beneficial for drivers of large vehicles who can find it difficult to see pedestrians immediately below them (SRA, 2013); and
- Coloured lights in the tactile paving on both sides of the crossing to clearly show when pedestrians should cross or not (Burgos, 2012).

The US Highway Design Handbook for Older Drivers and Pedestrians recommends:

- To accommodate age differences in perception-reaction time it is recommended that an all-red clearance interval be consistently implemented according to the presence of pedestrian crossing facilities;
- The consistent use of a backplate with traffic signals on roads operating at speeds of 65km/hr or higher or in lower operating speeds where there is potential for sunglare problems, site history or other variables;
- Wherever feasible, fixed lighting installations are recommended where there is the potential for wrong way movements through collision experience or engineering judgement, where twilight or night time pedestrian volumes are high or where shifting lane alignment, turn only lane assignment or a pavement width transition forces a path following adjustment;
- Regular cleaning of lamp lenses, and lamp replacement programme for all fixed lighting at intersections;
- Older pedestrians have an exaggerated start up time before leaving the kerb, assumed walking speed of 0.85metres/per second is recommended; and
- It is recommended that placards explaining pedestrian control signal operations and presenting a warning to watch for turning vehicles be posted near all intersections with a pedestrian crosswalk/zebra crossing (Staplin L, Lococo K, Byrington S & Harkey DL, 2001).

Visibility Splays at Junctions

The Highway Design Handbook for Older Drivers and Pedestrians recommends the following:

- Intersections should meet at a 90 degree angle where right of way is not restricted and not less than a 75 degree angle where right of way is restricted; and
- At skewed intersections where the approach leg to the left intersects the driver's approach e.g. at an angle of less than 75 degrees the prohibition of turn right or red is recommended (Staplin, Lococo, Byrington & Harkey, 2001).

Roads

Stakeholder consultation as part of this study highlighted a number of factors for consideration in terms of roads:

- Care should be taken to ensure we are designing for all, including older people of which, some can be less mobile than others;
- Uniformity of design standards;
- A checklist for designers; and
- Audits (new design and review of existing).

Analysis of accident data and video footage of road crossings in Scandinavia led to the conclusion that low vehicle speeds can help pedestrians whose limited sight distances and reduced walking speed make it difficult to negotiate normal traffic conditions (Johansson et al cited in SRA, 2013).

On the basis that, as well as reducing the number of collisions, reducing speed will also reduce injury severity, a review of research for the state of Victoria in Australia concluded that area-wide (or zone-based) speed limits should be introduced where there is a high proportion of elderly pedestrians, along with 'gateways' and pavement treatments to provide a signal to drivers that they are likely to encounter pedestrians and should therefore reduce speeds (Road Safety Committee, Parliament of Victoria 2003 cited in SRA, 2013). In Australasia, road infrastructure is designed and operates in a way to ensure that in the event of a collision, energies are kept below the thresholds likely to result in death and serious injury by reducing the impact including travel speeds. This approach is called the Austroads' Safe System Approach. It is considered that the current driving system makes no allowance for the older drivers' performance. Difficulties particularly include, reading signs, crossing and turning at complex intersections, merging, following road markings, responding to traffic signals and driving under poor light conditions (OECD, 2001)(Classen et al., 2006 cited in Oxley, 2010). Given the overwhelming evidence that the major problem for older drivers is gap selection at intersections (of both assessing vehicle distance and speed) road design and operation enhancements that address these problems are crucial.

The WHO recommends that the dangers of roads would be reduced through an approach that prioritises vulnerable road users and limits the speed and volume of traffic through traffic calming measures (WHO, 2004 cited in BMA, 2012). Also, driving as a task can be made easier by personal assistance in the car or improving driver performance through education. Collisions could be prevented by assessing persons' fitness to drive (Davidse, 2007).
A driver assistance system is simulated by oral messages that are sent depending on the situation drivers finds themselves in and how they behave in a particular situation. The study of a driver support system (Advanced Driver Assistance Systems – ADAS) indicated that the driver assistance system has a positive safety effect for all age groups. Some of the support messages were thought to have increased the workload as the result of a new task adding to the driving task (listening to and processing the information of the assistance system). This is expected to wear off over time. Older drivers were positive about the usefulness and satisfying character of messages regarding safe gaps to join or cross, obstructed views of the intersection and deviating traffic rules or road situations (different speed limit, one-way street). 60% of older participants considered the messages came too late in the actual experience of the driver system, therefore system settings should be adjustable (Davidse R, 2007).

International studies have shown measures such as lower speed limits, roundabouts and appropriate signal timing for both cars and pedestrians can reduce pedestrian accidents. Many older people request signal-controlled crossings and central pedestrian refuges. (Dunbar, Holland & Maylor, 2004). Other measures for consideration include:

- Kerb build-outs (or extensions) can both narrow the road to reduce the distance a pedestrian has to cross, and help to overcome issue of visibility where there are parked cars (SRA, 2013);
- Dividing the crossing task, for example with a refuge island was another approach suggested following Johanssen et al's analysis of road crossings and accidents. Oxley (2010) suggested that refuges are effective because they provide a safe place for elderly people to rest while simplifying the crossing task and suggested that such refuges may also reduce vehicle speed. The review for Australia suggested that where there is not enough space for a refuge island or median strip, a painted area on the road surface could be provided (although it is not clear whether there is any evidence that such treatments reduce casualties)(SRA, 2013);
- Reduce the volume of traffic on some roads by pedestrianisation (Burgos, 2012); and
- Establish a ladder pattern of transverse features that break up the linear continuity of the carriageway and further encourage considerate driving (Urban Movement, 2011).

Action 3.3 Conclusions and Recommendations

Mobility Issues

It will become more cost effective and socially desirable to enable older people to remain mobile particularly as the proportion of elderly people increases. Design standards currently take little account, despite overwhelming evidence, of the needs of elderly people and highways tend to be designed primarily for vehicles rather than pedestrians.

The term 'disability' is a broad one. It includes people with physical, sensory or mental impairment. At a conservative estimate 12% - 13% of the population have some degree of impairment. (DMRB, 1992). This suggests the possible level of impaired mobility within communities that should be planned for. Disability includes locomotion, seeing, hearing, reaching, stretching, dexterity and learning issues. Older people in particular often have more than one impairment (DfT, 2005).

Road design manuals outline design criteria for the geometric design of roadways based on sound engineering practice. For the most part, these criteria have been developed primarily in regard to the performance capabilities of the 85th percentile 'design driver', that is, fit and relatively healthy young adults (Fildes etc et al, 2000; OECD, 2001; Waller, 1991) and therefore make little if any allowance for older drivers' performance. The 85th percentile is based upon the performance of vehicles and does not take into account the different skills and or abilities of drivers. Effectively, this means it is important to reduce speed or provide improved protection of those road users most at risk through infrastructure and other changes (Oxley, 2006).

It is thought that, at any given time, around 30% of pedestrians have impaired mobility (temporary or permanent) health impairments. Because of the ageing of the population in many countries around the world, public authorities must prepare for a future where a growing number of highly vulnerable people will be even more dependent on walking. It has been identified that people with impaired mobility, using wheelchairs or mobility scooters, have similar requirements to pedestrians for an environment that facilitates accessibility (International Transport Forum, 2011).

Recommendation – with the increasing demographic changes of the elderly population, design guidance should specifically include the needs of the elderly.

The CARE Database (European Community Accidents Database) evidences how the numbers of personal injury accidents may be diminishing for people of all ages but for the elderly, accident rates are increasing for those aged over 64, particularly for pedestrians. The reduction of vehicle speeds could be a key solution in reducing the number and severity of accidents (Urban Movement (2011).

Recommendation — roads should be designed so that vulnerable road users are always given top priority.

A high number of seniors are afraid of having an accident or being victimised when travelling (this was the case for 17% in Munich and 18% in Salzburg). It can be concluded that looking at barriers to the mobility of older people, not only mobility impairments and physical improvements, are essential. Confidence in their own abilities and an easy-to-use transport system that allows travelling free from fears are equally important (AENEAS, 2011).

Tactile Paving – was identified as a trip hazard by stakeholders and the over-use of blister paving can create instability issues for some users, particularly disabled or older people; (SBC, 2013 and DfT, 2005).

Older pedestrians may have different visual search patterns to other pedestrians, tending to spend a greater amount of time looking down in order to better place their feet to avoid falls. (Road Safety Committee, Parliament of Victoria, 2003). Falls are the leading cause of injury-related visits to hospital emergency departments in Ireland (SRA, 2013). Older people are more fragile and falls can have much more serious consequences for them than for younger people. The fear of falling can therefore be a serious psychological barrier to older people's mobility. (Economic and Social Research Council, 2005 cited in BMA, 2012). For older road users to maintain their confidence, the maintenance of roads is very important to minimise possible trip (and other unexpected) hazards.

Recommendation – quality footways should be constructed and maintained to reduce the fear of falls.

Table 30 compares the indicative costs of the specific improvements with the DfT values for avoidance of casualties in 2011. This shows that in monetary terms the equivalent cost of the crossings and other highway improvements is beneficial and justified by small numbers of casualties[2] - similar to or less than the average number per year at the sites studied. Thus in rather simplistic assessment, such schemes can pay for themselves within a short period of time at sites such as these, with relatively high concentrations of elderly pedestrian casualties (SRA, 2013).

Table 30 Comparison Between Cost of Specific Highway Improvements and Value of Avoidance of Casualties

	£	Equivalent to fatality	Equivalent to serious casualties	Equivalent to slight casualties
Value of avoidance of fatal casualty	1,686,532	1		
Value of avoidance of serious casualty	189,519		1	
Value of avoidance of slight casualty	14,611			1
Cost of Pelican crossing	60,000	0.04	0.32	4.11
Cost of Zebra crossing	20,000	0.01	0.11	1.37
Cost of one pair kerb build outs with refuge	20,000	0.01	0.11	1.37
Cost of dropped kerbs, cobbled tactile strips & bollards	5,000 - 10,000	0.003 - 0.01	0.03 – 0.05	0.34 – 0.68
Cost of speed hump/ crossing with bollards	5,000 - 10,000	0.003 - 0.01	0.03 – 0.05	0.34 – 0.68
Cost of guide railings (say 20metres) @ £100-£150 per metre	2,000 - 3,000	0.001 – 0.002	0.01 – 0.02	0.14 – 0.21

[2] Although a full economic assessment would also take into account other factors, principally delays to vehicles

The limited evidence available from the SaMERU project suggests that safety interventions have a high benefit cost ratio over a short time period and this is supported by the wider research evidence (SRA, 2013).

I'DGO reported that a survey of designers revealed that they have limited knowledge of how to consider the needs of older people in the design of streets and neighbourhoods (I'DGO, 2007). The quality of the street environment is very important to older people's mobility and therefore their health (I'DGO, 2007). Seating, at regular intervals of at least 100 metres, for resting purposes, has been identified as a key need for elderly persons due to the difficulty in walking a long distance because of health conditions associated with ageing, such as shortness of breath and lack of stamina. (I'DGO, 2007; OISE, 2007; Sra, 2013).

Recommendation – to promote improved accessibility and safety for the older non-motorised user, road improvements should be considered including the provision of seating.

Urban Movement (2011) advises that suggesting what is best practice in one location, will not necessarily be appropriate in another location. However, consistency in design is considered very important (The US Highway Design Handbook for Older Drivers and Pedestrians). Uncertainty about the status of a section of road can lead to the avoidance of walking in certain areas and can therefore discourage older people from walking there. However, there is an increasing body of reliable UK evidence indicating that removing barriers to walking in busy, mixed use urban streets does not make them less safe for pedestrians.

Footways

Wide flat footways, avoiding steep gradients, lower kerb heights and a minimum of street furniture all help footways to be more easily used by older people. The use of mobility scooters and bicycles on footways (SBC, 2013) can be reduced through the introduction of wider footways but where this is not practicable, training or enforcement can help reduce this conflict. Inconsiderate parking can be deterred through physical measures, such as by installing bollards, raised planters or other street furniture, and by clearly indicating where people should park (DfT, 2007).

Visual, hearing, cognitive and physical mobility impairments experienced by elderly people mean that they could benefit from the following highway improvements even more than other pedestrians.

- Wide, uncluttered and well-maintained pavements;
- Streets which are not congested by parked vehicles or queues of traffic;
- Closely spaced formal crossing points;
- Low speed limits; and
- Simple road layouts.

Simple road layouts with low speed limits minimise the opportunities for vehicles to take pedestrians by surprise due to speed or 'unexpected' manoeuvres (such as reversing, turning, or driving in the 'second' lane in two-lane one-way streets) (SRA, 2013).

Pedestrian Crossings

It should be noted that 38% of pedestrian deaths of people aged 65 and over occurred at intersections in 2008 in the US (IIHS 2000 cited in Staplin L, Lococo K, Byington S & Harkey DL, 2001). Elderly people avoided using formal crossing points if it meant going out of their way; walking difficulties are likely to have influenced these decisions. (Atkins, 2012 cited in SRA, 2013)

The provision of formal or informal crossings to reduce the width of the road the person needs to traverse can be helped by the provision of narrow crossings, kerb build outs or traffic islands, or allowing longer crossing times to help reduce severance and possible isolation.

The assumed 'normal' walking speed of 1.2 metres per second (m/s) is utilised internationally as the basis for pedestrian crossing timings. The results in the study by Asher (2012) show that pedestrian crossings requiring a walking speed of 0.8m/s may be more appropriate, because this would allow the 'average' man or woman over 65 years of age sufficient time to cross. More crossings should be provided in areas with higher numbers of older people or sheltered housing (DfT, 2005).

In the United Kingdom, the elderly prefer to use Pelican crossings (green man opposite crossing) (SRA, 2012). The PUFFIN crossing appears to provide the best 'engineering' solution by introducing uncertainty for the pedestrian but this is one of the issues that can be more difficult for older people to deal with and can deter the use of such crossings and therefore can isolate people or encourage less safe routes. This could be overcome by installing countdown facilities which would assure the user there was sufficient time for them to cross the road.

Burgos reported measures to advise the driver in advance that there was a raised crossing by installing signs to encourage vehicles to brake before arriving at the crossing. Other small speed humps were introduced at the entry/exit to a roundabout (Burgos, 2012). In addition, stop lines were repositioned further back from the crossing, making drivers stop further back, giving pedestrians more space and at the same time making them easier to see. (Burgos 2012)

Countdowns at pedestrian crossings were suggested by stakeholders (SBC, 2013) and successfully used in Burgos (Burgos, 2012). Analysis during a trial in London has indicated no serious increase in risk (Earl, 2011) and interviews with users found that most people preferred it to standard crossings; 83% of those interviewed and 94% of mobility impaired pedestrians liked them.

Pedestrian crossings with lights submerged in the footway, utilised in Burgos (2012), may help guide elderly people who tend to look down when walking to avoid trips and falls.

Recommendation – When designing crossings, engineers need to recognise the mobility issues of older pedestrians so that they are safe for them to use and not put fragile people at risk. Further investigation is needed to understand the complexities of technical approval processes. It is not clear how wider consideration of the needs of older people feeds into this and how improvements can be requested. A dialogue with older people should form part of the technical review process when standards or new legislation is introduced.

Barriers Including Guardrailing

Barriers and fences have been found to reduce the extent to which pedestrians attempt to cross between junctions or formal crossing points. They reduce accidents at such points, and are recommended in several studies. However, such barriers need careful design and guardrails can make it more difficult for drivers to see pedestrians (SRA, 2013).

Guardrailing can be used as a way of controlling the use of footways by preventing pedestrians stepping into the road and from cars encroaching onto the footways. The use of guardrailing, however, raises other safety and accessibility issues such as older persons who try to reduce their journey by using direct desire lines. There has not been sufficient time to research this particular road feature in sufficient detail and it is recommended that more research be undertaken to assess it's use.

Recommendation – further research be undertaken to understand the appropriate use of guardrailing to support the older road user. Site visits with stakeholders and involvement in early design is essential in deciding the extent or necessity for barriers. The natural response is to consider that barriers equal safety, but this may not be the case and the designers must be able to justify the benefits of less is more. Better public spaces often lead to decluttering and removal of street furniture. A clear rationale is needed to justify the design.

Signage and Traffic Signals

Signage and traffic signals should be conspicuous and the placement of signs, using large fonts and with a high level of reflectivity, mounted overhead where practical and avoiding complex designs are recommended. Colour contrasts for fences, guardrails and street furniture including seating should be used (DfT, 2005). Further details regarding good practice for sign design are provided in the report entitled WP 2 Actions 2.15 – 2.18 Weller, 2013.

Bus stop design should take into account disability issues (DfT, 2005). In addition, they should be provided at regular intervals, have more audible and visual information and protection from all weathers (Southend, 2013). The current standard distance interval between bus stops is 400 metres. However, as detailed in this report, walking for more than 100 metres can be problematic for the elderly. Therefore additional seating, leading to and placed between bus stops, would make bus stops much more accessible to the elderly.

Recommendation – the provision of bus stops at more frequent distances than 400 metres should be promoted along with additional seats. However, the effect on bus timetable, frequency and reliability needs to be taken into account. Reviewing the location of bus stops and proximity to health centres, doctors` surgeries, libraries etc, is important as is the routes to and from the bus stop.

Roundabouts, Intersections and Roads

Roundabouts were found to reduce the number of collisions (Elvik R, 2003, Van Minnen J, 1990 cited in Davidse R, 2007) and lower speeds also reduce severity of crashes which would be beneficial to older road users (Robinson EW et al, 2000 cited in Davidse R, 2007).

Measures should focus on reducing the complexity of intersections (Oxley, 2010).

Recommendation – to reduce the speed on highways so that elderly road users have more thinking time and reacting time as a pedestrian or a driver.

Typically, older people look more carefully and wait for longer gaps between vehicles before trying to cross. However, they appear to accept gaps that are not long enough to allow them to cross safely unless the approaching vehicle slows down. They may be primarily basing their judgements on distance rather than allowing for the speed of a vehicle as well as its distance. An observational study found that older women are more likely than other pedestrians to take account only of nearside traffic before starting to cross, attending to farside traffic once they have reached the middle of the road (Dunbar G, Holland CA, Maylor EA, 2004).

Other significant causes of accidents at right turns in the UK in addition to appropriate gap selection are high task complexity, the presence of other road users, high approach speeds of conflicting traffic, high traffic volumes and limited or restricted sight distance (Oxley, 2006). The top three design features judged to have a strong association with collisions included:

- A lack of use of separate signals to control movements in each turn lane;
- Restrictions in available sight distances; and
- Insufficient perception-reaction time distance for intersection sight distances

A right angle junction is preferable for older road users (Davidse, 2007) to maximise available visibility due to their possible restricted mobility issues.

Design

The onus is on the highway designer to minimise potential conflicts between older pedestrians and vehicles when designing and auditing schemes. It is very important to consult the groups that represent the elderly and other relevant mobility groups. There is also a serious need to consider which user has priority (i.e. the vulnerable or the protected road user?) There are some conflicting research results, depending upon who is given priority and for what purpose.

Recommendation – designers need to consult the relevant elderly groups when designing or auditing road schemes.

However, it is not necessarily about the design of a road but how the design is used (e.g. pedestrians who were crossing a road, 29% of accidents involved a collision with a vehicle which was either reversing, doing a U-turn, or driving the wrong way down a one way street, and 19% were in collision with a vehicle which was turning). These manoeuvres are more difficult to anticipate, particularly for elderly people who are more likely to have restricted head movements, declining visual abilities, greater difficulty assessing complex traffic situations and the need for more time to process information (Department for Transport, 2001 cited in SRA, 2013). Also in terms of design and maintenance, control of issues caused by the elements, such as weather (i.e. ice, rain, floods, fog, bright sun and snow) on the roads to enable mobility, are very important (Wennberg, 2009).

Education and Training

To increase the proportion of daily walking and cycling as a means of travel is also a good way of improving physical cognitive abilities. Education and training should be widely promoted to older drivers, cyclists and pedestrians. Walking is in many cases the last independent mode of travel available to elderly people after they have given up driving, perhaps due to impairment. It is important for their independence and quality of life to have a safe environment in which to walk to local shops and facilities and to access public transport. Indeed there is evidence that losing independent mobility in old age can lead to both mental and physical decline, causing a burden both for the individuals concerned and society in general (SRA, 2013).

It is thought that there is also a need to educate drivers to better understand vulnerable road users such as driver behaviour at intersections, pedestrian crossings, when turning or manoeuvring and to moderate speed when near vulnerable road users (Dunbar G, Holland CA, Maylor EA, 2004).

Recommendation – there is a need to train the elderly in the use of new travel opportunities, for example personalised travel planning (PTP), opportunities to use mobility scooters, how PUFFIN crossings and tactile cones work. Driver training and other general road safety training for the elderly should be provided.

There is also a need to promote courteous road behaviour and train other road users, including children and adults, regarding mobility issues that may affect older travellers.

There is a need to train designers so they more fully comprehend the mobility issues that may affect the older car driver, pedestrian and other road users. Training suits such as GERT that was demonstrated at the SaMERU final conference in March 2013 should be used.

Recommendation – The SaMERU project is about supporting Safer Mobility for the Elderly Road User. Further research should be carried out into the benefits and costs for society to support the improved mobility of the elderly.

Work Package 4 - Accident Investigation

Introduction

The research reported here focuses on the investigation of collisions involving elderly road users in order to produce recommendations for data gathering and analysis. The results are based on desk top research of general relevance to this topic as well as information provided by the SaMERU partners; Southend-on-Sea Borough Council (UK), Lancashire County Council (UK), City of Burgos (Spain) and City of Modena (Italy).

Key Findings

- Information on the amount of exposure to risk is essential when considering the safety of older groups
- The number of injuries due to falls may equal or exceed the number of injuries due to collisions with vehicles in the case of older pedestrians
- Collision information should be obtained and shared through partnership working by the emergency services, hospitals and local highway authorities
- Falls are greater in number for women than men and women suffered more fractures
- Older drivers tend to limit the amount of driving they do after dark, so the time of day profile for collisions may differ from the general population

Aims and Objectives

The specific outputs required from this research are listed below:

- Recommendations for gathering information about accidents involving elderly road users
- Guidance for partnership working between highway authorities, the emergency services and health service
- Guidance for analysing information on elderly road user collisions
- Recommend risk control measures for use during the collection of data at the location of the accident (risks to quality of data).

Methodology

Social Research Associates (SRA) assisted with this Work Package and is familiar with the project having previously carried out a survey of the perceptions of elderly pedestrians at locations in Lancashire and Southend where safety schemes had been introduced.

For this research the following actions were carried out.

A questionnaire was designed by Lancashire County Council (LCC) and SRA and sent to the SaMERU partners requesting information about accident collection. This included a flow chart template to complete showing the process and organisations involved (see Appendix on the SaMERU website). The following partners provided data; Southend-on-Sea Borough Council (SBC) (UK), Lancashire County Council (LCC) (UK), City of Burgos (Spain) and City of Modena (Italy).

1. LCC collected this information internally and from partners and supplied it to SRA.
2. SRA analysed the information received
3. SRA carried out wider research and analysis to contextualise the SaMERU experience
4. SRA provided a draft report to LCC and partners for comment
5. SRA provided a final report

Action 4.1: Lessons for Good Practice

Background - The Need for Data Relevant to Understand Problems Facing Elderly Road Users

Older people are an important group of road users not least because their numbers are increasing as people are living longer and staying mobile into their later years. Table 31 clearly shows the vulnerability of older road users aged 65 and over.

Table 31: Proportion of Road User Fatalities Aged 65+ by Road User Type and Country EU-23 (2009)

	Pedestrian	Moped cyclist	Motor-cyclist	Car occupant	Others	Total
BE	47%		1%	14%	23%	17%
CZ	37%		1%	14%	22%	19%
DK	37%			18%		20%
DE	57%	24%	3%	21%	40%	27%
EE				11%		18%
IE				17%		17%
EL	49%		4%	15%	38%	19%
ES	44%	12%	0%	17%	17%	19%
FR	53%	5%	2%	19%	20%	19%
IT	57%	22%	3%	24%	42%	26%
LV	32%			12%		19%
LU						
HU	37%		1%	12%	29%	20%
MT						
NL	43%		4%	22%	44%	29%
AT	49%		7%	21%	37%	25%
PL	32%	19%	1%	8%	29%	18%
PT	49%	47%	3%	20%	18%	24%
RO	40%	14%	1%	8%	20%	21%
SI				17%	26%	23%
SK	22%			10%	13%	13%
FI				22%		25%
SE			4%	26%	36%	26%
UK	36%		2%	17%	20%	18%
EU-23	42%	17%	2%	17%	29%	21%

Percentages only for cells with at least 50 fatalities of all ages. 2008 fatality data used for IE and SE

Source: CARE Database/EC
Date of query: November 2011

There are more elderly male fatalities than elderly females (62% men 38% women in the EU-22). However, the proportion of female fatalities in this older age group is more than in the general population (24%). In terms of per million population, by age group and by gender the fatality rate across the EU for men is more than twice that for women (127 per million and 55 per million respectively) but there is a large variation between countries with the comparable UK rates being 54 and 34 per mile.

Older Pedestrians
Pedestrians form the largest group and comprise 42% of all older road fatalities in the EU-22 and 21% of deaths to road users of all ages.

Older pedestrians have a greater risk of injury at junctions where the traffic environment is complex and when crossing wider roads where there is no central refuge. There is also a greater risk of being injured by reversing cars and trucks, on the road, in private driveways and car parks. (Volvo, 2013; Dunbar Holland et al, 2004).

Falls on the footway are an important factor when considering the safety of elderly pedestrians. Sjogren and Bjorstig studied Swedish hospital data for injuries in the road environment and found that falls not associated with vehicle collisions were as numerous as those where pedestrians were hit by vehicles. In the case of women, falls were greater in number and led to more fractures. Damage by tree roots, uneven paving slabs, detritus and uncleared ice and snow all contributed to a high risk of falls. High kerbs were another source of trips and falls.

Older Cyclists and Motorcyclists
There is very little data on the types of accidents to older cyclists and motorcyclists. Much of the research has focused on motorcyclists between the ages of 30 and 50 years and very little on those who are older (60+). A recent paper by Jackson and Mello (2012) studied injury patterns of older motorcyclists (60+) in the USA where there has been a rise in the number of older motorcyclists on the road and of those injured. Injuries sustained by older motorcyclists tend to be more severe than for younger ones. The causes of the collisions leading to these injuries was not studied but Dischinger et al (2006) reported that there is a higher incidence of striking structures such as overpasses and road side objects and of overturning.

Older Drivers
Urban roads across the EU present the greatest risk for older drivers with 47% of fatalities being reported compared with 40% on rural roads and 4% on motorways. For middle aged drivers (45-64 years) rural roads present the greatest risk with 54% fatalities. Part of this difference can be explained by older drivers tending to avoid driving on high speed complex roads, such as motorways. This pattern can be seen in Table 32 (DaCOTA, 2011).

Research has consistently shown that older drivers are less of a risk to others but more of a risk to themselves, because as drivers age, they become increasingly frail and prone to more serious injury and death than younger drivers. Taking kilometres driven into account, the oldest drivers (75+) are more than five times at risk of death than the average for all drivers but their injury rate is lower at about twice that of the average driver.

Table 32: Distribution of Middle Aged and Elderly Fatalities by Road Type and Country 2009. EU-23 (not EU-24)

	Elderly (65+)				Middle-aged (45-64)			
	Motorway	Non-motorway		Total	Motorway	Non-motorway		Total
		Rural	Urban			Rural	Urban	
BE	6%	43%	45%	**163**	17%	52%	26%	**212**
CZ	1%	43%	56%	**167**	2%	62%	36%	**237**
DK	2%	57%	41%	**61**	9%	61%	30%	**64**
DE	5%	45%	50%	**1.104**	14%	60%	25%	**963**
EE	0%	0%	0%	**18**	0%	0%	0%	**20**
IE	2%	0%	0%	**47**	0%	0%	0%	**34**
EL	6%	10%	1%	**275**	8%	18%	3%	**300**
ES	10%	57%	33%	**507**	18%	65%	17%	**627**
FR	5%	56%	40%	**796**	6%	71%	24%	**899**
IT	4%	39%	57%	**1.111**	11%	49%	40%	**944**
LV	0%	61%	39%	**49**	0%	80%	20%	**70**
LU	44%	0%	44%	**9**	62%	0%	31%	**13**
HU	1%	39%	60%	**166**	4%	61%	36%	**236**
NL	5%	47%	45%	**187**	16%	46%	36%	**127**
AT	5%	52%	43%	**159**	14%	59%	27%	**147**
PL	1%	30%	40%	**810**	1%	51%	31%	**1.280**
PT	4%	41%	54%	**205**	12%	48%	41%	**206**
RO	1%	18%	81%	**593**	1%	37%	62%	**766**
SI	13%	38%	49%	**39**	19%	44%	38%	**48**
SK	0%	43%	57%	**51**	3%	45%	51%	**103**
FI	1%	71%	28%	**69**	5%	73%	22%	**59**
SE	4%	54%	35%	**102**	5%	70%	25%	**99**
UK	3%	40%	44%	**432**	8%	56%	25%	**502**
EU-24	4%	40%	47%	**7.125**	8%	54%	31%	**7.959**

%s do not sum to 100 in countries where Road type is unknown for some fatalities. 2008 fatality data used for IE and SE

Source: CARE Database/EC
Date of query: November 2011

The types of collisions in which older drivers are over-represented are turning out of minor roads onto major roads and from major roads into minor roads, especially the left-turn in continental Europe and right-turn in the UK, Republic of Ireland, Malta and Cyprus.

On the other hand, older drivers are under-represented in collisions involving drink driving, speeding, loss of control and using mobile phones.

Older drivers tend to limit the amount of driving they do after dark, so the time of day profile for collisions may differ from the general population. For example, in the UK 85% of deaths among all modes of transport occur between the hours of 08.00 and 19.59. This compares with the EU average of 83%. One third of deaths occur between 12.00 and 15.59 hours.

The Link Between Collisions and Deprivation

The higher incidence of road casualties in deprived areas has been known for some time (Christie, 1995; White et al., 2000; Graham et al., 2005). Christie (1995) has shown that residents of deprived areas tend to have relatively higher numbers of casualties, while Graham et al. (2005)

presents a strong relationship between deprivation at a collision site and the occurrence of child and adult pedestrian casualties.

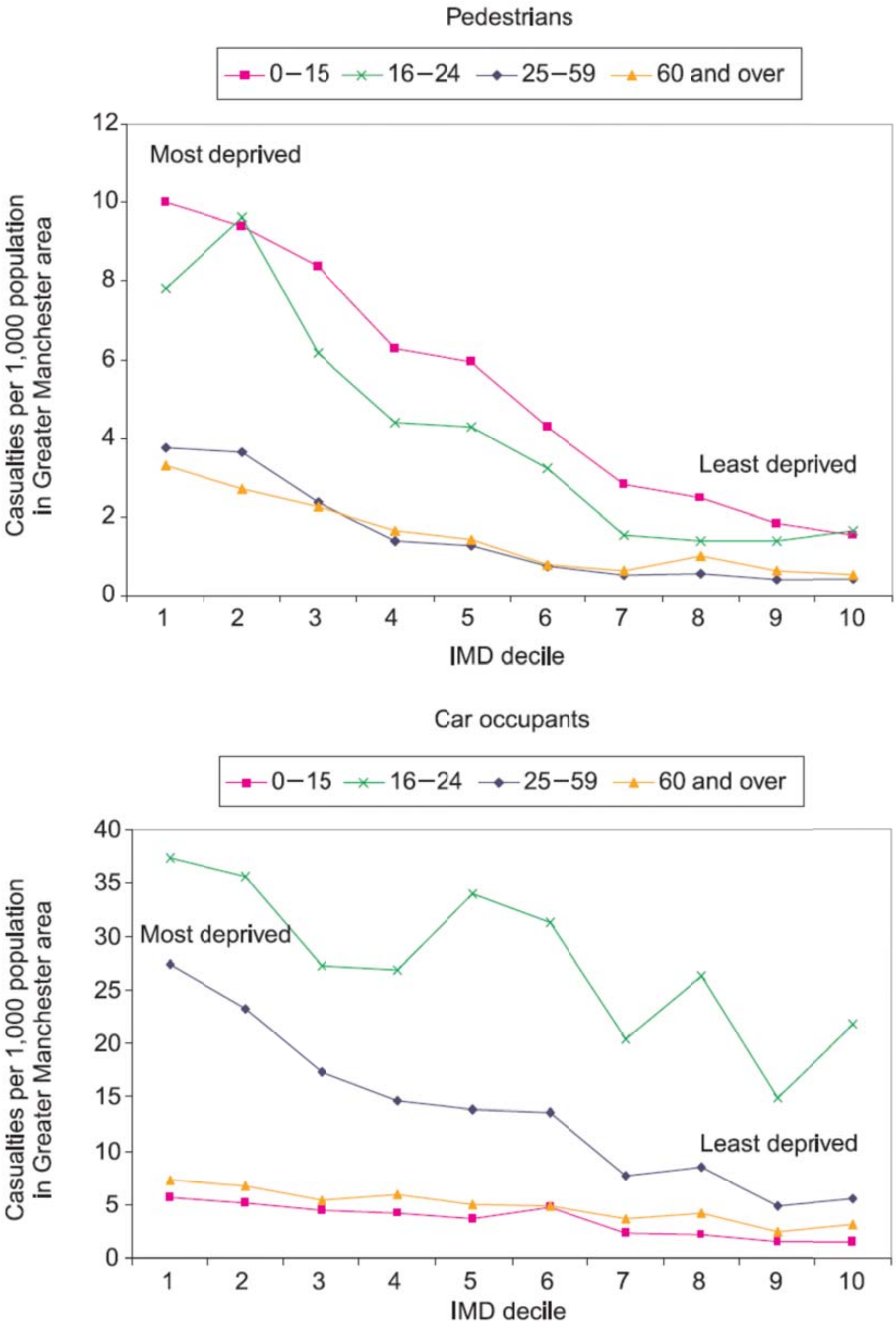
Figure 33 clearly shows the strength of the relationship between deprivation at the collision site and the number of casualties per 1,000 population by age group and Index of Multiple Deprivation (IMD)[3] across the ten Greater Manchester Authorities in North West England.[4] Importantly, this relationship is particularly strong for children and young pedestrians, with the child casualty rate in the most deprived IMD decile about five times that in the least deprived. This relationship also holds for adults and older pedestrians, where the ratio is about 4:1. Analysis of national casualty data in deprived areas (2007) by the UK Department for Transport shows the ratio of the most deprived quintile compared with the least deprived for pedestrians of all ages being 3:1.

A similar relationship may also be seen for car occupants, although it is weaker than for pedestrians. The interesting feature here is that the line is quite shallow across the deprivation deciles for older car occupants, indicating that deprivation may not play such an important role for this age group.

[3] The Index of Multiple Deprivation is an index used by the UK Government based on small area geographies (lower super output level) and measures deprivation across 7 domains including income, employment, health and disability, education skills and training, barriers to housing and service, living environment, and crime. They are usually grouped into deciles or quintiles of super-output areas according to IMD ranking

[4] Although not Neighbourhood Road Safety Initiative (NRSI) areas. Trafford and Stockport were included to give a broader range of areas as these two districts are more affluent than the rest of Greater Manchester.

Figure 33. Casualties in 1999–2001 per 1,000 Population in Each Age Band in Each IMD Decile for Pedestrians and Car Occupants in Greater Manchester



The brief description of road user groups, demographics, injury type and severity as well as the links to disadvantage demonstrate the range of data required to describe and understand the road safety issues facing older road users and how these differ not only from younger adults but amongst this heterogeneous group of those aged 60 plus.

Casualty/Collision Data Collection, Analysis and Quality

The following partners completed a questionnaire and provided details about how casualty/collision data was collected: Southend-on-Sea Borough Council (UK), Lancashire County Council (UK), City of Burgos (Spain), and City of Modena (Italy). Table 33 gives the combined picture gained from the partners.

Table 33 - Casualty/Collision Data Collection

1 Which organisations in your city/partner country currently gather casualty/collision data?
The police collect casualty/collision data in each partner country.
2 What data is collected?
The police in each partner country collect data at the scene according to a national or regional protocol (STATS19 in UK, ISTAT in Italy). Additional data about the accident can be collected and used locally. The ambulance and fire services collect their own data, which is processed at the hospital
3 How is it shared?
In all cases data are passed to a national or regional centre to be collated into the national database. Data and reports are published at least annually. In each case there is more sharing with local partnerships such as those including the police, fire and ambulance services, next tier of government (province, county, region). This is done on a regular basis, usually every 3 months though reports of fatalities are usually shared daily. In Lancashire there is a data sharing and exchange forum which includes the hospital and the regional Public Health Observatory. This level of data sharing is not typical among the national partners. In Southend and Lancashire there is specific mention of sharing data with the public through reports and websites. An example of a flow chart can be seen in the Appendix on the SaMERU website.
4 How is it used to support partnership working, and to prioritise activities?
A) Immediately following a collision
In the UK the council is informed of a fatality immediately and a site investigation follows to ascertain whether the highway contributed to the accident.
B) Short term planning (up to 1 year ahead)
Each partner country uses data to produce targeted reports every 2-3 months and share with local partners to consider emerging trends, plan interventions and evaluate effectiveness.
C) Strategic Planning (1-5 years ahead or more)
The data are used to develop transport plans and strategic priorities with partners. In Italy, the state allocates funding to regional monitoring centres, which then allocate more locally on the basis on the data.
5 How is the data profiled?
Data is profiled according to age, road user type, location, time of year, day of week, time of day. In the UK, a postcode allows casualty and driver home area location to be identified.

6 What do you consider to be the general risks to data quality for your city/partner country?
Inaccurate location of accident due to the report being compiled from memory or different systems of geographical co-ordinates being used. Conflicting witness statements or witness leaves the scene making it difficult to understand what happened. Accident not reported or reported but not on the highway (in car park etc.) or police take too long to submit report if accident very serious or dealt with by another police force. The form is not filled out well by police officer with lack of detail of what happened. Some data not filled out due to concerns about privacy or controversial circumstances.
7 What do you consider to be the risks to data quality regarding older road users aged 65+ for your city/partner country?
Fear of elderly driver losing licence and therefore independence could lead to lack of clarity over accident details. Older people with caring responsibilities could be unclear due to worries about losing licence There may be issues regarding confusion, memory problems, sensory impairments – sight or hearing, which hamper good data collection.

These results show some common problems and gaps in data collection and analysis which are explored on a wider basis in the sections below.

Collecting Information about Collisions

Relevant and accurate collision and casualty data are needed to quantify the scale of the road safety problem facing elderly road users. This information is necessary to investigate the causes, design effective and cost effective countermeasures and provide relevant data for monitoring and evaluation. As noted above, the group is heterogeneous so problems and solutions will differ for each age and gender grouping.

Information about road collisions is collected by the police in each partner country according to a template or protocol which allows locally collected information to be uploaded onto regional and national databases, although these databases are not always held by the police who collect the data.

All partner countries collect data on fatalities and injuries. However, not all are able to distinguish between the severe and slight injuries. This is a major problem because older road users tend to be more severely injured than younger ones and thus bear a bigger burden of injury. To begin to distinguish greater from lesser severity good partnership working is needed between highway authorities and the hospital in order to provide diagnosis and accurate assessment of severity including whether a casualty is hospitalised.

Some countries collect a limited amount of damage only collision information, which is also collected by some insurance companies but it was not collected by the SaMERU partner countries.

The emergency services and hospitals are increasingly being seen as important sources of data on road casualties because the extent of under-reporting among police collected data is now being recognised (Derriks, 2007). In addition, the police find it difficult to assess severity of injury because they are not medically trained. Therefore access to diagnosis from medically trained hospital staff is helpful in assessing the true range of injury severity (Ward et al, 2010). The SaMERU partners made use of full data sharing and exchange with the emergency services in Lancashire. More informal partnerships with emergency services in Spain, Italy and Southend provided some further information.

Data provided by the fire and ambulance services were found to be valuable sources of information on collision locations.

Older pedestrians are particularly at risk of falling on substandard footway surfaces. As noted above, there can be as many injuries, including fractures, due to tripping in the road environment as being struck by a vehicle. Whilst strictly not road traffic accidents, these are a measure of the safety of the road environment for the elderly.

The European Transport Safety Council (ETSC) published a report in 2006 on road collision data in the enlarged European Union, which provides detailed and relevant information on data collection and storage. Their main recommendations for improving data collection included:

- Conduct periodic reviews of data collection systems to ensure they meet the needs of those who use them without placing an undue burden on those who collect the data. Thus a balance has to be found between the needs of the collector and the needs of the user. If police forces are asked to collect too much data, the quality of the reporting is likely to suffer. The police should be trained to collect data and understand the reasons for its use. Ideally they should benefit by using it themselves.
- Damage only collisions, where there is no reported injury, still contain valuable information. There are various estimates regarding the number of these ranging from 15 to 30 times the number of injury accidents. Insurance company data is useful for gaining information on damage-only accidents but, if not available, periodic sampling should be undertaken.
- Information on the accurate location is often missing or incorrect. This is an important piece of information required by road safety professionals to assess the road environment for possible remedial work. If possible, police should be provided with a handheld GPS to record this information.

In addition to relevant data on road accidents, information is needed to enable exposure to risk to be quantified for the older road user and compared with younger adults and children in order to prioritise the allocation of road safety resources. Exposure data are generally the most difficult and expensive to collect because they require travel surveys that distinguish age and gender across all road users. If travel surveys are patchy in coverage or not up-to-date, then traffic flows and speeds across the network may provide alternative sources of information.

A population based denominator, derived from census data, may be used to estimate risk. Although this is a proxy measure, it is an important method for assessing the size and scale of the problem. For example, in most countries, the fatality rate of elderly men is twice that of elderly women despite there being more women in the population in this age group (DaCOTA 2012). The number of licences held by men and women of different age groups may be used as a denominator and whilst not everyone who has a licence drives, it may be a better denominator than population for car occupants and motorcycle users.

In most countries, the public health services collect data on disadvantaged groups because there are clear links between poor health and poor living conditions. This data should be used particularly when assessing the wider determinants of road traffic injuries.

Action 4.2 : Guidance for Analysing Information on Elderly Road User Collisions

Relevant up-to-date data are necessary for developing policies, strategies, and programmes to help improve the safety of older road users. In order to do this, an accurate evidence based picture of the problem is required thus underlining the importance of appropriate analyses, interpretation and reporting. The reports should be in a format suitable for professionals, policy makers and the general public. This may require more than one style of report.

In some authorities, the accident and casualty data are available on-line, so interested professionals and the public may undertake their own analyses. Improvements in computing techniques mean that large datasets can be displayed with interactive visual analyses, which help lay people to understand them. Road safety data collection and analysis partnerships should make use of such technology wherever possible. Examples include; visual display of journeys made on foot, by bicycle or car; density of resident population of various ages; socio-economic variables etc.

The following are standard analyses with annotations to describe major differences between older road users and middle aged or younger ones.

Road Collisions and Casualties

1. **Road user type;** pedestrian, car driver, car passenger, pedal cyclist, motorcyclist, other. Older road users are most vulnerable as pedestrians and this becomes more so with increasing age over 70 years.
2. **Age;** the older population is not homogeneous, so an appropriate age breakdown is needed. Usually two groups are used, 60-74 and 75 and over as these represent different stages in risk.?
3. **Gender;** there are more older women than older men but the fatality rate is higher for older men.
4. **Severity of injury;** as people age, they become physically more frail so the severity of injury increases for what might appear to be moderate forces in a collision.
5. **Time of day, day of the week and season of the year;** may differ for older people who may have more flexibility in when to travel and their increasing reluctance to drive at night. Analyses need to take account of these variables.
6. **Complex road environments;** a younger or middle aged population may have more flexibility in the category of road they use. The elderly tend to be injured on more complex urban road environments.
7. **Road feature - junction, pedestrian crossing, bridge etc.;** older drivers are more likely than average to have a collision at a junction, to strike road side objects in single vehicle accidents and to be injured crossing wider roads without central refuges. This list is illustrative rather than exhaustive and circumstances will differ from place to place.
8. **Collision causation;** some police forces collect what are known as collision causation factors, or attendant circumstances. These are actions of each participant which the reporting police officer considers to have led to the collision (looked but did not see, excess speed, confusion, fatigue, view obstructed etc.)

Denominators for Calculating Casualty Rates and Risk

Numbers of collisions or casualties, studied on their own, can be misleading because they do not tell us about how much of an activity is being undertaken. The example cited in this report has been that of elderly men who are at twice the risk of death in a road collision than elderly women. However, whilst more men are fatalities than women (EU-23 62% men and 38% women, in the UK it is 55% and 45% respectively) there are more older women than men in the population, so when divided through by the numbers of each gender and age in the population the fatality rates for men are even higher (EU-23 127 per million population men and 55 per million for women). A better picture of the extent of the problem would be seen by noting the amount of walking or driving done by each age group and gender. For example, are older road users at more risk than younger ones as pedestrians, drivers, passengers or cyclists?

1. **Population** is a blunt instrument for use as a denominator but all countries have this information, so it is used for comparison purposes. Numbers in the population by age and gender at local, regional and national levels are useful indicators.
2. **The number of licences** held by licence type, age and gender is another denominator which could be used. However, it should be borne in mind that, as populations age, more people give up driving but still keep their licences.
3. **The number of registered cars** is usually available but is not disaggregated by age and gender, which limits its usefulness.
4. **Exposure in terms of distance travelled** is a good indicator of risk but data is difficult to capture especially for pedestrians and pedal cyclists. Although drivers over 75 years of age are at higher risk than the average per kilometre driven, it should be borne in mind that they drive much shorter distances.
5. **Distance driven,** time spent, or number of trips as driver or passenger of a car, distance walked, number of roads crossed or time spent walking.
6. **Distance cycled** or time spent cycling as a pedal cyclist or motorcyclist.

Health and Disadvantage Information

1. Information on relative levels of disadvantage. Each partner country has its own measures by which public health professionals identify and target communities in need.

2. From the health sector:
   - Diagnosis by medical professionals regarding injury severity and part of the body affected. Injury patterns differ between age groups with more fractures being sustained by older road users. Hospital data is important to identify trips and falls on the footway or carriageway where no vehicle is involved as well as injuries caused by vehicles.
   - Number of people attending Accident & Emergency (A&E) departments with injuries from traffic collisions. Most people involved in a collision begin their medical assessment and treatment in A&E departments. These can provide reliable data on the proportion of serious injuries and are valuable in helping to quantify the extent of under-reporting of casualties by the police.
   - Number of people hospitalised as a result of a collision and time spent in hospital. Fractures of the neck, femur and pelvis are serious injuries for older people and can result in an extended stay in hospital. The hospital data, not only gives accurate information on numbers admitted with different types of injury but also how long the person was hospitalised. Besides individual trauma, this is a real cost to society in terms of utilisation of health care resources and should be borne in mind when costing interventions to improve safety and mobility of older road users.

These analyses highlight the need for partnership working in order to access the various data sources. There may be issues of confidentiality regarding sharing data from the health sector, emergency services, and insurance companies. However, these can be overcome by agreeing a data sharing protocol between members of the road safety data collection and analysis partnership, which sets out how the data may be used and by whom. The complexity of some of the analyses underlines the need for a dedicated data analyst who is adequately funded and trained.

Action 4.3: Risks to Data Quality

Data quality is a major concern in all partner countries. Errors and omissions may arise in:

- Accurate descriptions of the incident, road conditions, types of vehicle, casualties, accident causation, witness statements. A common error is in the geographical location of the collision making it difficult to establish patterns on the network where older road users are being injured.
- The collision is reported to the police but the report is not logged onto the database and is therefore lost.
- The collision is reported but not all casualties are accounted for and registered.
- The collision is not reported to the police.
- The investigation takes so long that the report is submitted after the year's records have closed for publication.

Under-reporting is perhaps the biggest challenge to data integrity. As the extent of this is becoming better researched and understood, individual highway authorities could start undertaking their own studies into local data quality, which would then lead to identification of areas for improvement. This is another example of where good partnership working is needed to improve the integrity of data collected by the health and police authorities.

One of the barriers to good reporting is a lack of understanding by the police of the value of the collision data and the benefits to society in terms of reducing the number of victims and hence the misery suffered and also reducing the cost to public health services. Better training and motivation of police forces is required in order to improve data quality and reduce the time taken to enter collision data on to databases.

Data collection specifically on older road users has its own set of challenges. Some of these come from the older road users themselves who are fearful of losing their driving licences after a collision and may therefore be reluctant to report the full facts. The situation may be similar in the case of older people who care for others or volunteer in the community. A further issue around some older drivers is that they may become confused and upset at the scene and are unable to accurately recall the circumstances of the collision.

Data may be unrecorded in the case of older road users, who tend to be more severely injured and transported from the scene by ambulance before the police arrive.

A poor quality database may restrict the ability to extract relevant information about elderly road users. For example, it may not be possible to carry out multiple searches and cross-tabulations to determine age, gender, road user group and time of the collision.

Conclusions

Gathering Data

Reliable data are essential to understanding the problems and needs of older road users. This group is very heterogeneous because there are age, gender, socio-economic, cultural, time of day, day of week and seasonal differences, which should be taken into account when designing data collection and analysis tools.

In particular, it is important to inform the police and others about the value of accurate data in reducing collisions and the need for common data architecture.

A more accurate assessment of injury severity should be achieved by collecting more data from the emergency services, hospitals and insurance companies.

It is also important to share data and work across organisations and departments through road safety partnerships. Such partnership working is sometimes difficult to achieve because people instinctively erect barriers and funding does not always give a high priority to joint working across organisations or even across departments.

Analysis

Key additional data is required in order to quantify risk and relative risk both within older road user groups and between other age groups including children. Unfortunately, exposure data are generally the most difficult and expensive to collect because they require travel surveys that distinguish age and gender across all road users. However, a population based denominator derived from census data may be used to estimate risk especially if supported by other intelligence such as licence holding and data on disadvantage. The latter should be used particularly when assessing the wider determinants of road traffic injury.

Older pedestrians are particularly vulnerable to falls in the road environment and these can equal or exceed the number of injuries caused by collisions with traffic. Good partnership working with local hospitals is essential to enable data to be gathered and a key factor is the time period chosen since the adverse health effects of collisions involving elderly people are often of long duration.

Risks

Older people may sometimes be confused after a collision, when they are only slightly injured, or even not injured at all. This may affect recall of the circumstances, so trained and motivated police who understand this can help improve the quality of data collected.

The SaMERU project including the final conference has contributed to a greater awareness of data collection and analysis needs in relation to collisions involving older road users and this will prove a lasting legacy.

Work Package 5 – Sustainable Transport Modes and safety

This work package includes research on sustainable modes and safety, specifically investigating public transport, cycles and mobility scooters. Public Transport accessibility has been researched along with driver and passenger training. This section covers cycle safety for older people and the use of safety equipment and training workshops. The use of mobility scooters and accidents involving them has been examined for each of the partner cities along with the laws applied to their type and usage.

Recommendations

Training for Transport Personnel

- Requirements for improved policies and procedures for public transport operators improved training for staff and improved monitoring of implementation by staff in practice.
- Newly qualified passenger carrying vehicle (PCV) drivers/new public transport drivers should receive training booklets and information on disability awareness and social inclusion.
- Drivers need to be trained to pull close to the kerbs.
- Need for awareness of increased frailty of older passengers whether or not they have obvious mobility problems – if involved in a collision a passenger over 80 is twice as likely to be killed or seriously injured as a young adult.

Training for Passengers

- To provide training for passengers in the form of personalised travel planners or travel buddies that escort new passengers on their first few trips.
- In order to increase passenger confidence provide bus hailers, communicator cards and safer travel units.
- Examples of best practice as experienced by users of public transport should be communicated and rolled out across EU member states.

Access

- Consistency in implementation of accessibility measures is required nationally and across EU member states to enable seamless local, long distance and international travel.
- Collaboration is needed between vehicle and equipment designers to better accommodate wheelchairs, mobility scooters, walking frames and other mobility equipment, pushchairs and luggage on public transport. To have a push button fitted to alert drivers that the ramp is required for a passenger.
- To provide easy access ramps on public transport vehicles. Also, to provide raised kerbs and "kneeling" vehicles to reduce the gap and height difference between the bus and the kerb.
- Guaranteed pick up schemes should be considered by local transport authorities and bus operators in partnership with local taxi services on "accessible" bus routes.
- Legislation to provide more space for people with mobility issues on future transport stock.

Partnerships

- Set up a partnership agreement to be signed by the Council, Older People Organisations and public transport operators to agree meeting dates, objectives and targets.
- Have regular Public Transport Partnership meetings between public transport operators and Councils.

- Review partnership agreement objectives regularly.
- Consultation with user groups. Listen to feedback and monitor improvements.

Procedures for Dealing with Accidents and Medical Emergencies

- Compulsory first aid courses should be required for staff.
- Public transport operators should have step-by-step accident and emergency procedures.
- Public transport drivers should have a better understanding of the Disability and Discrimination Act and the Equality Act in the UK and presidential decrees in other countries.

Cycle Safety

- Have segregated cycle lanes so as the conflict with pedestrians and vehicles is minimised.
- Educate cyclists, pedestrians and drivers to give one another more respect and understanding.
- Make it mandatory for cyclists to wear a safety helmet.

Cycle Training and Education

- Provide cycle training workshops. Tailor the length of the course to the requirements of the participants.
- Provide separate training for different age groups, as the Burgos study found that women below 50 years of age learn quicker than those aged over 50 years.
- Tours and events can be organised to encourage bike riding and improve people's confidence on their bike.
- There is a need to promote the use of safety equipment.

Mobility Scooters

In association with retailers the Government, police and national safety organisations should be encouraged to develop legislation that ensures the following:

- A mandatory requirement that retailers must provide written proof that every scooter sold or hired has been tested and is mechanically sound.
- Every new user has a mandatory induction/training course with appropriate accreditation which ensures that the user understands the relevant law and that they can safely handle the machine.
- All users should have a health check which ensures their vision, hearing and mobility is adequate to ensure the safe use of the vehicle.
- Retailers should be working with the relevant organisations to ensure people buy the most appropriate vehicle for their needs and abilities.
- Mobility scooter accidents should be monitored in the same way as other vehicle collisions.

Actions 5.1-5.4: Public Transport Training, Access, Partnerships and Medical Emergencies

A report was produced that covers actions WP 5.1-5.4. The report covers the training of public transport personnel and passengers and accessibility of public transport. The methods that are used to deal with accidents and medical emergencies affecting older people are reported. Examples already employed in Council's to promote partnership working between pubic authorities and transport operators have been examined. The report concludes with recommendations and guidance on good practice for both public transport operators, personnel and also passengers. The full report titled 'WP5 Sustainable transport modes & safety' (Southend-on-Sea, 2013) can be found on the SaMERU website.

People with mobility issues should not be restricted from using public transport. Travelling around and enjoying life is increasingly important, especially for independence and well-being. It is crucial that public transport is accessible for all, especially those with mobility issues and older people.

Below are extracts taken from the International Association of Public Transport (UITP) (2005) guidelines report titled 'Improving Access to Public Transport'. The guidelines are intended to be a brief good practice guide for staff in the passenger transport industry.

Understanding passengers' needs will help to:

- Reduce accidents
- Reduce boarding and alighting delays
- Make travel a more pleasant experience
- Make a more rewarding job for operating staff

The main fears for passengers are:

- Where can I get my ticket?
- Where do I find my stop/platform/desk/gate?
- Is this the right bus, train, ship/plane?
- Can I get on or off in time?
- Am I holding everyone else up?

Many passengers have disabilities which may not be visible:

- People with arthritis
- Individuals who are deaf or hard of hearing
- People with heart disorders
- Passengers with artificial limbs

Physiological changes associated with ageing are shown below :

- Hearing:
  30% of all people over 65 have significant hearing loss which may result in reduced understanding of normal speech and slower sound processing.
- Vision:
  Delayed light/dark adaption, difficulties estimating distance, speed and direction of motion.
- Movement & Support:
  Restrictions in movement, grip between 30 and 40 percent, difficulty standing.
- Touch & Motion:
  Unsteadiness, clumsiness, increased risk of injury, loss of control.
- Balance:
  Difficulty estimating movement and slower reaction time, reduced ability to plan movements.
- Gait:
  Reduced speed, step height, difficulties in accurate stepping and reduced maximum toe-floor clearance (leads to stumbling).

Southend-on-Sea SaMERU Stakeholder Meeting

As part of the SaMERU project, Southend-on-Sea Borough Council held a stakeholder meeting on 14th February 2013 to directly focus on buses. Two Public Transport Operators from Southend-on-Sea attended the meeting. Three workshops were held which involved the stakeholders providing comments and improvements for the following three aspects of a bus journey:

Workshop 1) Planning a journey
Workshop 2) Getting to and from the bus stop
Workshop 3) The bus journey including getting on and off the bus

Covering all three workshops, 5% of the comments and suggestions related to driver training. Under workshop 3, which covered the bus journey, 15% of the comments related to driver training.

The questions that the public specifically asked the public transport operators and the responses during the question and answer session are shown below:

Q – Why are drivers not trained to drive near to the kerbs for easy access?
A – Drivers are trained and should pull close to the kerbs, however sometimes people park in bus stops and prevent buses from stopping correctly.

Q – Why do bus drivers pull away too soon?
A – Drivers should not pull away too early. Please tell the bus operators the bus fleet number and the time you got on the bus, the bus operator can then identify the driver. Drivers are checked on regularly and re-tested.

Q – Are there any ramps on the buses for easy access?
A – On some buses there are automatic ramps, whereas on others there are manual ramps which the driver has to pull out. When the bus fleets are renewed the ramps will be automatic. Automatic ramps will make buses more accessible for all including buggies, wheelchairs etc.

Q – Can we have conductors on buses?
A – Buses are now a commercial business and conductors would not be cost efficient. Bus operators could look for volunteers. It is hoped that drivers would help the public. Passengers are urged to speak to the drivers and sometimes drivers may forget to point out which stop to get off at, but keep reminding them.

Q – Why do bus drivers only know the route they are running?
A – Some drivers do not know enough route information. Southend-on-Sea's bus operators will include training on other route information for drivers to learn in future training.

Q – Pushchairs not being folded get in the way.
A – Bus operators are trying to make buses more accessible for all people to use, including those with buggies.

A number of the issues raised at the stakeholder meeting have also been researched and are included within this report.

Training Transport Personnel

Transport is truly accessible if the travel needs of those with mobility difficulties are met. Transport personnel are important as they are the front-line of providing this service of accessibility; being able to recognise and respond to the needs of people with any mobility difficulty and ensuring that those have a pleasant and memorable journey. This in turn allows the passenger to feel confident and allow them to travel on public transport without any worries.

The majority of bus companies in the SaMERU partner cities provide up-to-date, appropriate and relevant training to bus drivers. The benefits of training helps retain existing customers and gain new customers through excellent customer service.

Benefits of training transport personnel

- Raises awareness of the different people one may encounter during a journey and having the knowledge that is required during each individual interaction.
- Offering excellent customer care is a growing issue. Public transport services need to constantly provide an efficient and professional alternative to keep existing customers and to gain new ones.
- Provide an excellent service so any passenger is confident to travel with ease and experience a pleasant journey.
- Ability to assess each situation and act accordingly.
- Offer a caring and helpful service – providing assistance if required and being patient.
- Removes barriers to independent travel for passengers.

Concerns/Barriers

- Familiar phrases heard: "The ramp's not working", "Wait for the next one", "The wheelchair space is full".
- There is a need to improve the confidence of passengers on buses and those waiting at bus stops and stations.
- Disabled people, elderly people, people with pushchairs, or people who have a different first language to the country they are in are just some of the groups who would appreciate a considerate driver.
- Fear of crime - drivers must be prepared for all situations that might arise.
- Drivers are the front line so need to be prepared. 50% of the drivers time is driving, the other half is spent dealing with customers.
- Frequency.
- Reliability.
- Space for wheelchairs/mobility aids.
- Will there be a seat?
- Anti-social behaviour.
- Will the bus be low floor?
- Knowing when to get off.

Training Best Practice

Transport personnel should go through a vigorous training process to ensure that they are to the required high standards to provide an excellent service to the public.

New driver training booklets should be provided to newly qualified PCV (Passenger Carrying Vehicle) licence holders which contain all the information needed to enable the driver to become more than just a qualified driver but to be trained in order to provide an excellent all-round service to the customers. Information should also include a guide to daily operations, procedures and policies.

A UK bus company, Stagecoach provides a separate booklet which focuses on disability awareness and social inclusion. This is a very important part of the customer service to ensure each and every passenger receives an equally welcoming and pleasant journey. It helps the driver understand the disability legislation, their responsibility, to know what assistance they can offer a disabled customer, understand the barriers that disabled people face when using public transport, understand the meaning of social inclusion and the implication for the customers and the driver, develop the skills to deal with customers with a variety of disabilities, understand when and how to use the current equipment available on buses to assist disabled customers.

The booklet provides customer service information for bus drivers and provides questions for drivers to think about and answer, which can then be discussed. It also gives scenarios and questions for what they would do, and asked for the driver to think of a bad and excellent customer service experience and question it.

There is also a complaints procedure where all drivers must make a note of all the relevant details and inform their manager if such a scenario should arise. The customer should also be given details of who, and how to contact their manager as they may be unable to assist with the complaint. If the complaint involves the driver, they must not take it personally and remain calm and professional throughout.

Travel Training for Passengers

Training is required for transport personnel but may also be undertaken by passengers. Access to transport for older people is often dependent on having the ability to use public transport; older people may find themselves without the use of the car for the first time in many years, either through their own deteriorating health or the death of a spouse/partner who drove them around. In such circumstances, travel training can potentially prevent social exclusion and loneliness, and help them in everyday tasks.

Recognising that many travel training schemes seek to encourage people to use public transport, private transport operators are often engaged in travel training schemes to provide assistance at the implementation stage. Involvement tends to be either through the provision of funding or staff involvement in the scheme planning. In a number of schemes, public transport operators have assisted in providing vehicles for training purposes, such as familiarising potential users in how to get on and off vehicles and practice. The public transport operator also benefits from this because the passenger becomes familiar on what they are expected to do, and this will speed up boarding and alighting time.

Providing practical assistance to disabled or older persons helps enable them to retain their travel independence. Travel planners or travel buddies can provide training for passengers by escorting new passengers on their first few trips, which helps to build the passengers confidence.

The potential benefits help to retain existing and gain new customers as well as an enhanced reputation; by ensuring that transport staff have the appropriate disability awareness training to help people, and that passengers can travel in a safe environment. An essential element of the effective management and continuation of travel training schemes is the development of a robust monitoring framework. It is also considered good practice that feedback is sought from learners. Such feedback is vital in helping to ensure that schemes are responsive to needs and able to continuously improve the service they are providing.

Travel Training Schemes :

- The scheme needs to be clearly targeted towards particular individuals/groups, to be able to cater for specific needs.

- Set out why the scheme is needed and identify the main beneficiaries.
- Consider piloting the training with a small number of learners so that the training offer is tested and evaluated before roll out. The experience and feedback from pilot courses can prove invaluable in fine-tuning a scheme.
- Establish objectives and a monitoring framework at the outset. This will help ensure that the scheme remains focused on achieving its defined goals.

Below are examples of aids that passengers, including older and mobility impaired passengers can use to help them travel on public transport.

Bus Hailers

Partnership work between Galloway's Society for the Blind, Lancashire County Council and bus operators has led to the development of the "bus hailer" which aims to make catching the bus easier for visually impaired people. People can use the special hailer, an A5-sized flip pad, to help them easily flag down the right bus. Lancashire County Council has worked closely with Galloway's Society for the Blind to design the bus-hailer, drawing on similar initiatives by other local authorities both in the UK and internationally. It consists of three rows of bold and embossed numbers, each from 0 – 9, and various letters with the braille version underneath.

Figure 34 – Example of Bus Hailer

Users select the number of their desired bus and then hold up the bus-hailer to oncoming traffic so that the relevant bus driver knows to stop.

Figure 35 – Example of Bus Hailer Being Used

The word 'BUS' can also be shown if users are unsure of their bus number or can catch any bus on the route.

The black numbers and letters are on a fluorescent background so they can be easily spotted by bus drivers from a distance, come with a clear plastic protective wallet so that they can be used in all weathers, and have instructions in both braille and text.

Communicator Cards
There are various card schemes in operation to help to make the use of public transport easier, particularly for those with mobility problems, sensory impairments or communication difficulties. Users show their card to transport staff, to allow for individual extra help if needed, and drivers are trained to expect the cards and respond accordingly.

Transport for London (TfL) has a travel assistance card scheme called 'Travel Support Card' aimed at helping people with hidden disabilities such as hearing or communication.

First Buses Ltd (UK) have a safe journey card which is designed for letting the driver know what sort of help a passenger may need.

Figure 36 – Communicator Card Example

Lancashire County Council also had a communicator card which is shown in Figure 37.

Figure 37 – Communicator Cards in Lancashire

Access to Vehicles

Public Transport Access in Italy

In Italy Art. 27 of Law 118/71 states that, ".....public transport services, with particular reference to tram and metropolitans, have to be accessible for invalid people with limited mobility......". The Decree applying this Law is of 1978 (Presidential Decree 384/78) and also the Law 41/86 have to be considered.

The Decree 18/7/91 of the Minister of Transport states that all buses, both public and private, with more than 9 seats for the common transport of disabled people and other passengers, including buses for school transport, need to allow the access of people with limited mobility and those using wheelchairs.

Other Laws introduced are shown below:

- Law 104/92 Article. 26 states that regions and cities need to guarantee disabled people mobility, and provide it where public transport is not accessible;
- Law 21/92 states that taxis have to be accessible for disabled people and cities need to regulate and decide the minimum number of taxis used for the transport of disabled people;
- Presidential Decree 503/96 states that all public means are equipped for the safe transport of disabled people. Art. 24 states that public transport needs to have at least

three seats for people with mobility difficulties; have sufficient space for a wheel chair; facilitate the access to the metropolitan also through the installation of elevators;
- Ministerial Decree 236/89 Art. 2 recommends the installation of devices indicated nearby sources of danger, in particular for blind people (acoustic signals), signs in Braille for elevators and light signals for deaf and blind people.

Art.5 of Presidential Decree 384/78 and the Presidential Decree 503/96 state that vehicles transporting disabled people can: stop and circulate in traffic limited zones; circulate on reserved lanes for public means of transport and taxis; stop in no parking areas provided there is no hold-up to traffic. The vehicle needs to have visible the permit provided by the City of residence.

The State Railway Body applied several initiatives to facilitate the use of the train by disabled people. 110 stations provide welcome centres that are the reference points for the travel needs of disabled people.

Disabled people assistance during flights is regulated by specific provisions of air companies. Assistance is guaranteed both at land and during the flight.

Public Transport Access in the UK

In the UK the Disability Discrimination Act 1995 (DDA), (superseded by the Equalities Act 2010) allows the government to make regulations requiring all new land-based public transport vehicles - trains, taxis, buses and coaches - to be accessible to disabled people, including those who need to remain in wheelchairs. The regulations that govern access to service buses and coaches in the UK are known as the Public Service Vehicles Accessibility Regulations (PSVR) (DfT, 2000). The PSVAR have been applied to all new buses and coaches which carry more than 22 passengers and are used on local or scheduled services since 31 December 2000.

All full size single deck buses over 7.5 tonnes will be fully accessible from 1 January 2016, and all double deck buses from 1 January 2017. New buses weighing up to 7.5 tonnes and coaches will be required to have wheelchair access from 1 January 2005. All buses weighing up to 7.5 tonnes will be fully accessible from 1 January 2015 and coaches by 1 January 2020 (DfT, 2000).

In recent years low floor buses have been introduced in increasing numbers. Over one third of full size local buses are now low floor vehicles rising to over 80% in major urban areas.
The PSVAR, since 1 October 2002, required the bus driver or conductor to provide reasonable assistance to disabled people, including wheelchair users, to board and alight.

Transdev buses in Lancashire and most First and Arriva buses in Southend-on-Sea provide facilities for wheelchairs and mobility aids. Most vehicles have been specifically designed to provide full access to wheelchair users. All vehicles displaying the “wheelchair accessible” sign can carry buggies as well. To assist wheelchair users specifically, each adapted vehicle is fitted with a powered or manual ramp, which will be positioned by the driver when asked.

Public Transport Access in Burgos, Spain

In Burgos, the questionnaire from the Sameru project showed promising figures regarding public transport accessibility. More than 80% of older people stated that public transport offers good facilities for older people. Also, 95% stated that the distance and accessibility to bus stops was satisfactory. Older people from Burgos are high users of public transport, more than 30% use the bus every day, and up to 42% use the bus weekly.

In 2006, the CiViTAS project in Burgos supported a number of changes to the public transport system. The whole fleet was installed with low floor ramps and visual and verbal announcement systems. The city has received awards from disability groups and also received the Queen Sofia Award for cities offering good accessibility.

All buses in Burgos are adapted to the needs of people living with physical disabilities. The Municipal Transport Service responds to the needs of 180,000 citizens and runs a network of 30 bus lines on which an average of 42,000 passengers travel per day. The number of passengers using public transport has increased over the past three years by 6% which includes older people. In each bus there is enough space for two wheelchair users.

Despite these changes there are still some complaints. Some older people suggest that the public transport paying mechanism is difficult and there are also complaints about driver behaviour as passengers feel they do not help them properly. There is also a worried attitude from older people regarding falling over on the bus and the lack of seats for older people. Buses are provided with enough seats, but on many occasions are occupied by people that do not need them. In general drivers use the ramp when this is asked for by a passenger.

Commonly reported problems regarding public transport access:

- Competing demands on space for pushchair and wheelchair users.
- Lack of storage space for mobility aids such as walking frames.
- Any significant distance between the bus and the pavement complicates boarding and alighting. Drivers should be trained to pull up as closely as possible to the pavement. For example the bus operator Arriva, train their staff to make it easier for their customers to board vehicles; they provide their staff with a "handbook" on "Do's and Don'ts". They have also produced a booklet for their customers to read as well.
- Lowering the bus floor level known as "kneeling" helps to facilitate easier boarding and alighting.

Good Practice Designs for Improved Access

Low floor buses reduce the height differential between kerbs and the bus floor, and help make boarding easier. Any boarding point should be as 'clutter' free as possible.

Many vehicles are designed to accommodate wheelchairs. Where a user wants to board or alight from a vehicle the driver or conductor must deploy the lift or ramp, and if it is a portable ramp ensure that it is located in the correct position. If a wheelchair user needs to travel in their wheelchair they must only be driven in a wheelchair space and facing either forwards or rearwards according to the instructions or diagram for the use of the space.

Depending on the design of the vehicle, seats and armrests can be folded out of the way to allow space for a wheelchair. A driver or conductor must ensure that a wheelchair restraint system is correctly attached in accordance with instructions provided. This can be a system comprising webbing straps or clamps that attach to the wheelchair frame. A wheelchair space if it is intended for a forward facing wheelchair will be fitted with a wheelchair user restraint system that will look like a seatbelt.

Powered ramps where possible should be fitted. A push button for passengers should be fitted to alert the driver that the ramp is required. The gradient of the ramp also needs to be taken into account. The major determinants include:

- Type of ramp
- Carriageway & footway crossfalls
- Ramp length
- Distance of the bus from the kerb
- Kneeling height of the bus floor, whether the bus is laden

The use of raised kerbs is preferred as they result in lower ramp gradients to assist passengers, particularly those who are mobility impaired and parents with children in prams and pushchairs. Many buses and coaches are fitted with a kneeling system that lowers the vehicle closer to the ground.

Shelters should be provided at bus stops where possible, especially in residential areas. Shelters can include perch seating which gives comfort whilst waiting for bus services but they do not encourage people to wait inside the shelter for long periods of time, thus discouraging opportunities for vandalism and anti-social behaviour. Bus shelters need to be positioned to ensure sufficient footway space is available to allow free flow of pedestrians around the area. Bus stops should provide real time information signs.

Bus stops must have sufficient manoeuvring space on the carriageway to allow for easy access for pedestrians without being impeded by parked vehicles.

Driver training is equally important to ensure that buses are driven in a manner that fully utilises the facilities offered by the low floor bus and the kerb provisions.

Partnerships

Partnership working between public authorities and transport operators is essential to help the transport provider offer an efficient reliable service. There needs to be a Statement of Protocol that sets out the basic and over-arching aims of a partnership that can deliver the objectives and is intended to set out the over-riding principles that will be adopted.

Some UK Authorities have a Bus Punctuality Improvement Partnership (BPIP), which is a voluntary agreement between a local authority and bus operator designed to specifically achieve improvements in, and maintain consistency of punctuality and bus journey times in their area.

The protocol is a statement of best intentions to work in partnership to achieve the common objective that will operate to the benefit of all residents, businesses and visitors to the area. The partnership will be made up from two styles of partners:

- Primary Partners - include the local authority and the operators who would set up the partnership and decide the objectives to deliver.
- Associate partners - this would be made up of other interested groups to help implement the objectives, but are not the main decision makers of that particular partnership. Included in this group would be other local authorities, businesses etc.

The protocol also recognises that to encourage greater use of public transport and bus services in particular, a fully integrated approach is required. As well as the Primary Partners a number of

Associate Partners, including local businesses, rail operators and shelter suppliers should be invited to be signatories to the Protocol and agree to work with the primary partners to develop and improve all aspects of public transport provision, information and operation. Primary Partners in one element would also partake as an Associate Partner in other elements, e.g. bus primary partners would be associates in the rail partnership and vice versa.

Any partnership agreement should include a schedule of commitment and will have an opening statement stating what the primary objectives are. This would then be followed by each partner making its' own commitment statement and list out how it plans to deliver.

Review Partnerships Procedure
The Partnership should be a vibrant, pro-active forum for the improvement of public transport and bus services in particular. It is essential, therefore, that a procedure exists for updating and modifying the over-arching protocol and for other partners to be included. The protocol needs to include an ongoing review procedure with consultation meetings at least twice per annum. Agreement between the partners will be through negotiation and any partner wishing to withdraw from the Partnership would be required to give at least six months notice of their intention. There should also be a number of targets set in order to ensure that any partnership achieves its' goals and is not just a "talking shop". Some examples of public transport partnerships are shown below:

LAPTA (Lancashire Area Public Transport Association)
The role of the LAPTA group is to act as a regular meeting point between bus operators and the County Council to share ideas, discuss matters of mutual concern and to highlight issues pertaining to public transport.

The membership of the LAPTA will be made up of the following:

- Officer representatives from Lancashire County Council, Blackpool Council and Blackburn with Darwen Borough Council
- Representatives from bus operators with commercial services within Lancashire
- Representatives from bus operators with Lancashire subsidised service operations
- A representative from the CPT
- On an annual basis, the County Council Cabinet Member for Highways and Transport will be invited to attend
- From time to time, non-members will be invited to the meetings to discuss issues of mutual interest

LAPTA hold meetings four times a year chaired by a senior officer of Lancashire County Council. The meetings are used to discuss current and forthcoming issues related to public transport. These may include, for example, Department of Transport consultations and proposals affecting the bus industry, county council proposals etc. Also to discuss issues impacting on public transport in Lancashire for which the County Council is responsible. Issues may include: 20mph areas, road works and issues affecting the highways, disability awareness, concessionary travel, capital projects, bus quality etc.

Southend-on-Sea Public Transport Working Party
The role of the Public Transport Working Party is to act as a regular meeting point between bus operators, rail operators and the Council. The meetings enable discussion regarding matters of concern from all parties, to share ideas, discuss and to highlight issues relating to bus and rail.

The membership of the Public Transport working Party is made up of the following:

- Officer representatives from Southend-on-Sea Borough Council
- Representatives from bus operators with services within Southend-on-Sea
- Representatives from rail operators with services within Southend-on-Sea
- Councillors; and
- The Cabinet Member for Highways and Transport chairs the meeting.

Procedures for Dealing with Accidents and Medical Emergencies

The majority of bus services in the UK have procedures for dealing with accidents and medical emergencies.

There is often a perception that public transport is not safe. Concern about antisocial behaviour on buses led Lancashire County Council to set up the Safer Travel Unit in 2002. The aim of the Unit is to make bus journeys safer and more enjoyable for passengers and staff in Lancashire, Blackpool and Blackburn with Darwen. The Unit works in a successful partnership with bus operators, the Police and schools. For more information see: http://www.safertravelunit.co.uk

Each Lancashire bus operator commits to report all incidents of anti-social behaviour directly to the Safer Travel Unit by deploying existing CCTV systems to provide evidence and using working groups/discussion forums.

Transport personnel are made aware of the procedures for dealing with accidents and medical emergencies during their training. The information that is required is included in the training material received. Some bus companies provide extensive information on the procedures to be followed in the case of an accident or medical emergency. A step-by-step procedure of what must be done is provided, who to report to, what forms to fill in and how to act professionally at all times.

The procedure for dealing with accidents and medical emergencies is the same. If someone is injured or a medical emergency occurs, the emergency services must be informed. All accidents, no matter how minor, must be reported and an accident form completed. Alongside this is the health, safety and welfare of the driver, the passengers and other road users.

In any incidence the first concern must always be the safety of the passengers. Incidents include vandalism, enforced diversions from designated route, late operation, on-vehicle incidents with passengers and driver assaults.

Conclusions

While progress has been made in the development of accessible bus routes by local transport authorities and public transport operators, users of wheelchairs and other mobility aids report a lack of confidence in the reliability of services in that an accessible bus cannot be guaranteed, and where an accessible bus is provided they may be unable to board due to pushchairs or overcrowding.

Anti-social and inconsiderate behaviour on public transport (ranging from threatening and aggressive behaviour to failure on the part of a young able bodied person to give up their seat for an elderly passenger) is a significant problem in some locations, with the perception and fear of such behaviour having a considerable impact on confidence to travel and quality of experience.

A report on Disabled Access to Transport to the UK Parliamentary Transport Select Committee (January 2013) provides an overview of legislation and experience in practice of the accessibility of public transport in the UK. The findings of this report include:

- Disability legislations in the EU including the UK Discrimination Act legislation and the subsequent Equality Act are hindered by a lack of understanding and varying interpretation of the term "reasonable adjustments".
- Successful implementation of legislation varies, according to location, the transport providers policies and procedures and the actual practice pursued by individual staff.
- Whilst there has been a heavy focus on wheelchair users, those with other impairments and/or health conditions, and users of other types of equipment are often overlooked and may be discriminated against due to "not being disabled enough" to qualify for right of access and assistance.
- While the DDA Supplement, Part 3 Code of Practice, Statutory Code of Practice, Provision and Use of Transport Vehicles (Disability Rights Commission, 2006), "does raise the issue of blind and visually impaired people, deaf and hearing impaired and people with multi-impairments/health conditions", this Code of Practice is not legislation.
- While there is plenty of evidence of good practice for dealing with accidents and medical emergencies, there are too many diverse policies for each of the service providers.
- Mobility scooters are widely accepted in the hold of aircraft, yet frequently excluded from other modes of public transport.
- There can be difficulty in many locations obtaining an accessible taxi with a driver suitably trained and physically able to assist.

Actions 5.5-5.10: Bicycle Training, Education and Safety

Reports have been produced which cover actions WP 5.5 – 5.10. The reports include research into the risks to older cyclists from travel behaviour. The effectiveness of training and education and the use of safety equipment has also been reviewed. The full reports are listed below and can be found on the SaMERU website.

WP 5.5, 5.6, 5.7 - Bicycle Safety Perception of Elderly People in Burgos. (Burgos, 2012).

WP 5.8 - Effectiveness of Training. (Burgos, 2012).

WP 5.9 – Effectiveness of Safety Equipment Amongst elderly Cyclists. (Burgos, 2011).

Cycle Safety

During August 2011 a survey was undertaken by Burgos, Spain to determine the safety perception of elderly people who ride a bike. The survey helped improve the understanding of why elderly cyclists feel unsafe when riding their bike. The surveys were conducted on-street at six different locations by stopping and interviewing people riding a bike who appeared to be over the age of 65. 200 surveys were completed which included respondents from 55 years of age and upwards.

The main conclusions from the results showed that many people do not feel safe cycling because of the conflict with pedestrians and vehicles. For integrated or shared cyclepaths the conflict with pedestrians is the most evident issue, whereas for cycle routes on road the main issue is the conflict with vehicles.

Many of the respondents said that both pedestrians and drivers have a lack of respect for cyclists and do not give enough attention to them, which is why the conflicts with these modes of travel are perceived as unsafe.

Cycle Safety Survey

The surveys were conducted during August 2011 in the city of Burgos to determine the safety perception of elderly bike riders. The aim of the survey is to understand the reasons why elderly bike users feel unsafe when on their bike and to use the information found to improve safety for elderly bike users.

The aims of the survey were to:

- Achieve greater bike user participation of people over 65 years old.
- Identify patterns of cycling.
- Determine the perception of safety of different types of cycle paths.
- Survey key groups of elderly cyclists on safety perception according to variables, such as, age or sex.

The survey was conducted on-street by stopping and talking to people who were riding a bike. The interview duration ranged between three and five minutes, depending on the responses. The interviewers tried to only stop elderly riders in order to obtain better results and conclusions useful for the SAMERU project, which is specifically aimed at road users over 65 years of age.

The month of August was chosen for the survey because the good weather generates more cycling trips and therefore a greater number of respondents. Survey sessions were held on a number of weekdays during the month, which included:

- 1st Morning: 13:00 – 14:30
- 2nd Afternoon: 16:30 – 18:00
- 3rd Afternoon: 18:00 – 19:30

The locations of the surveys were chosen because a large number of cyclists used the routes and they were also conducive for people to stop.

The survey which can be found on the SaMERU website consisted of between eleven and sixteen questions depending on the answers. Information was obtained regarding:

- Personal data: age, resident zone, possession of bicycle
- Use patterns and riding habits: frequency of use, purpose of trips
- Safety behavior: safety equipment used
- Risk perception: perceived risk along the type of route they ride

More males were surveyed than females, however the responses do not differ between the two genders with regards to safety perceptions or uses of safety equipment, so the analysis has not been divided by gender. The majority of the respondents were over 65 years of age.

There were no major differences in answers to the questions in terms of where the respondents live. Many of the women over 65 years of age declared themselves in many cases as a housewife, however for men over 65 they stated they were retired or worked.

Figure 38 – Number of Bikes Owned in the Family

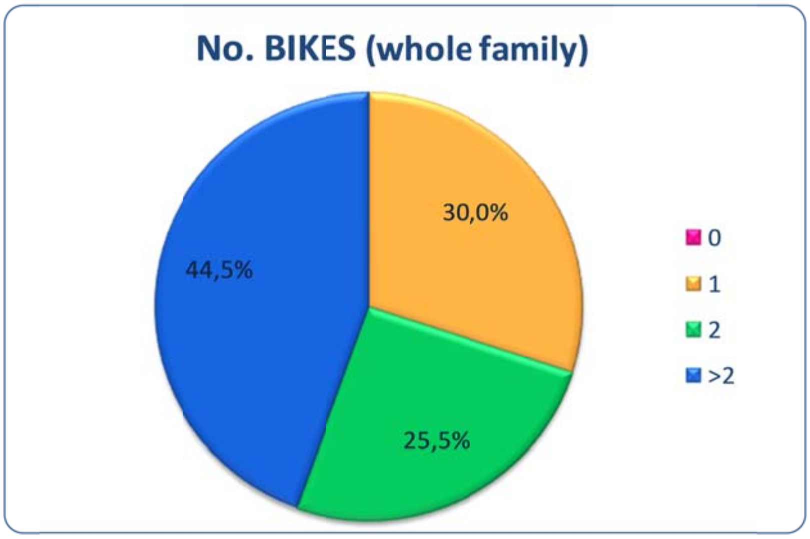


Figure 38 shows that all of the families had access to at least one bike, this could be their own bike or a bike that the whole family shares. Many of the families had at least one car, but 16% did not own any cars.

Figure 39 – How Often do you Ride a Bike and the Purpose?

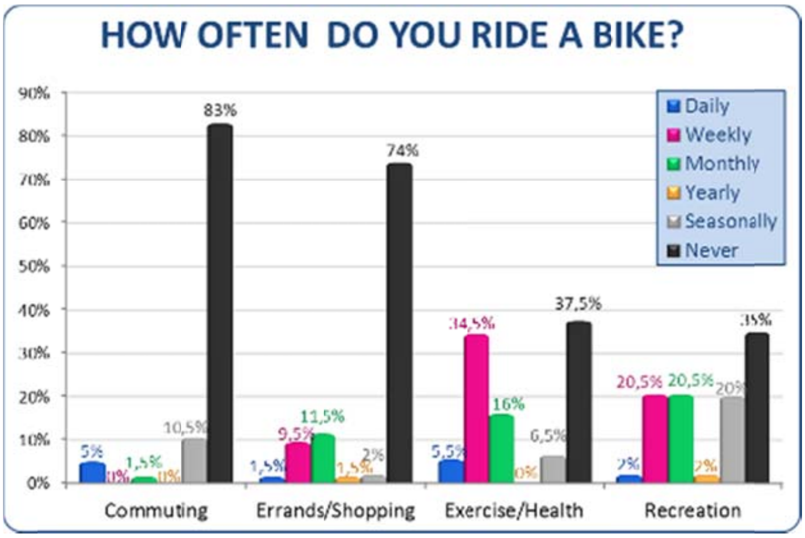


Figure 39 shows the results from the riding pattern questions and suggests that 5% of respondents use the bike daily for commuting, which is slightly higher than the national percentage of 3.8%. Also, 10% say they will use the bike for commuting depending on the season. There is quite a high percentage of people that use the bike for shopping or errands weekly and/or monthly but mainly at the weekend. Data obtained for the whole population highlighted that it is usual for the citizens of the city to use the bicycle at the weekend for shopping and errands. For exercise and recreation, some respondents explained that they had been advised by their doctor to do more exercise, so this is why the percentages of people riding weekly for health/exercise reasons was high. For recreation, there is a high percentage of elderly people who only use a bike when the weather is fair.

Figure 40 – Personal Safety Equipment

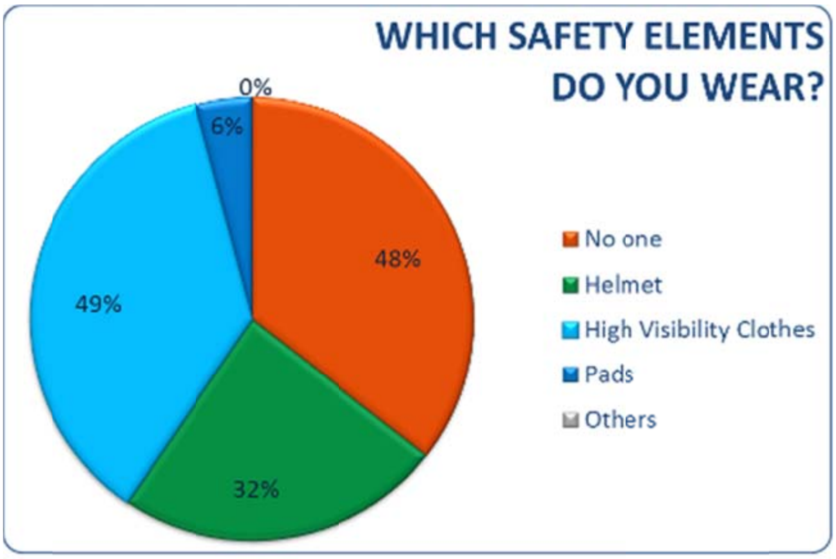
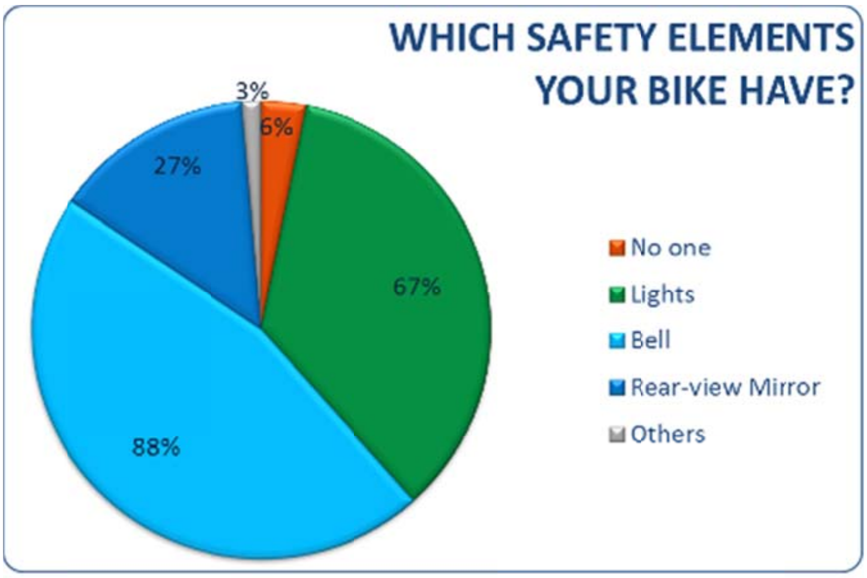


Figure 40 shows that the percentage of elderly people that use safety equipment for riding a bike is not very high, and 48% do not wear any safety equipment. 32% use a helmet and nearly 50% use high visibility clothes. The local laws of Burgos state that if people ride within the city and do not cross into the neighbouring town then safety equipment does not need to be worn. Many respondents said they felt safe so they did not need to use safety equipment, which was interesting as for the next question many stated that they sometimes felt it was dangerous to ride a bike even though they did not wear any safety equipment. The statistics show that around half of respondents do not use any safety equipment and only 6% use pads.

Figure 41 – Bike Safety Equipment



Regarding safety equipment for the bike, Figure 41 shows that a high percentage, 88% use a bell, and 67% use lights. People without a light may only use their bike during the day when there is enough light, which appears to be the case for elderly and retired people. 27% of respondents use a rear view mirror which they find very useful especially for riding on roads.

Figure 42 – What Type of Cycleways do you Use?

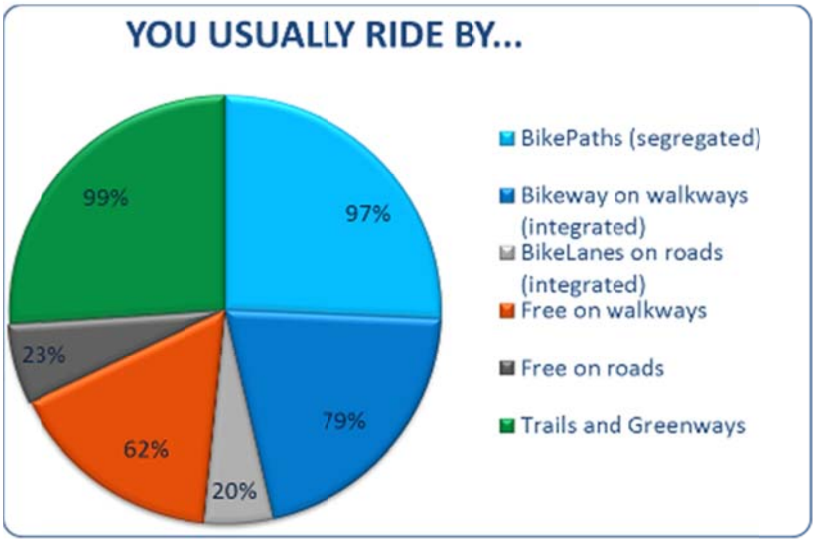


Figure 42 shows that the data provided by the survey clearly demonstrates that elderly people prefer to ride on segregated bikepaths, trails and greenways, mainly because they feel safer. Also they use the integrated bikeway on walkways and cycle on walkways with pedestrians, which they state they do because they have to use areas that do not have designated cyclepaths. Only a quarter use bike lanes on roads or they ride on-road.

Figure 43 – Perceived Safety on Different Cycleways

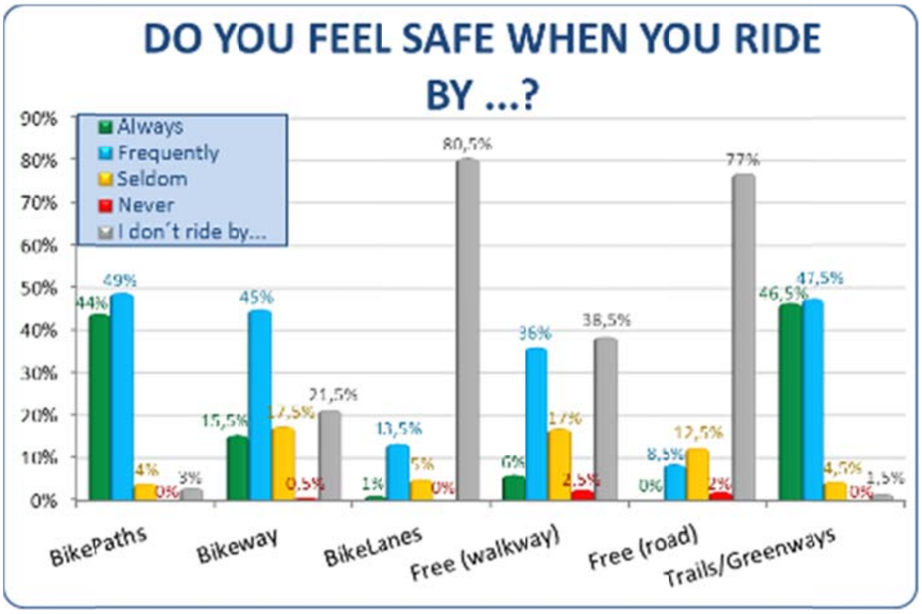
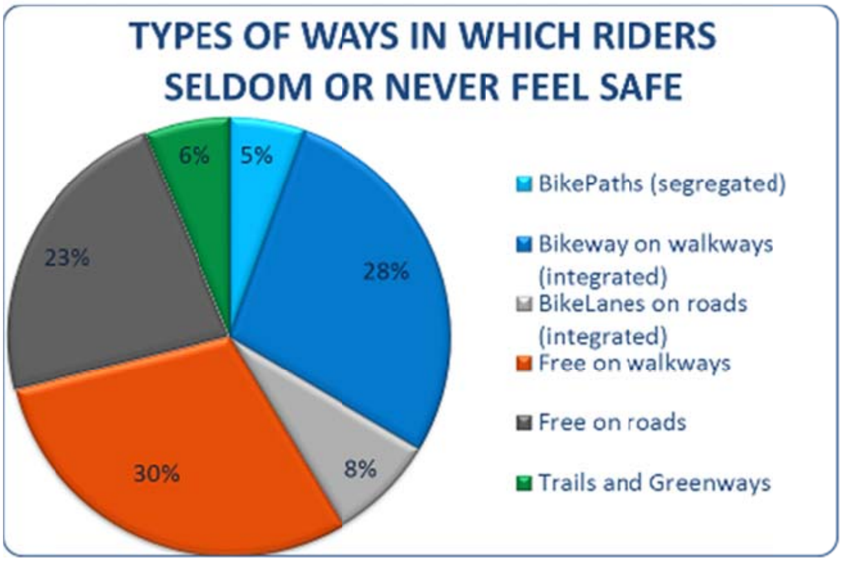


Figure 44 – Perceived Safety on Different Cycleways



Figures 43 and 44 show that 30% stated they do not feel safe riding on walkways which are shared with other users, nevertheless, 36% frequently use them. Also, 28% stated they seldom or never feel safe on a bikeway, however 45% frequently ride on them. All the respondents that cycle on roads that do not have any cycle markings said they feel unsafe and do not think it is safe at all. 77% of the respondents said they do not ride on the roads. 81% stated they do not ride on bikelanes which are on the road and 8% of respondents said these were unsafe. A very low percentage of the people feel unsafe on segregated bikepaths, trails and greenways and they stated they use these types of cycleways regularly.

Figure 45 – Safety on a Segregated Bikepath

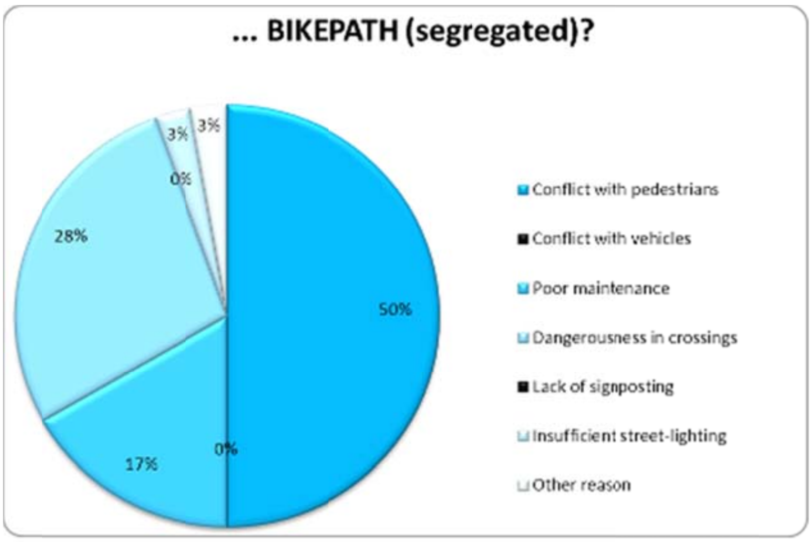


Figure 45 shows the main reason (50%) that people do not feel safe on a segregated bikepath is the conflict with pedestrians. Other reasons are the poor maintenance (17%) (dirt in many occasions) and the conflicts that occur between vehicles and pedestrians at crossings (28%). Local Burgos laws state that cycleways/paths are to have the same lighting as pedestrian areas, so the 3% of people that have raised the issue of lighting find that the lighting for both cyclists and pedestrians is not sufficient.

Figure 46 - Safety on Integrated Bikeways on Walkways

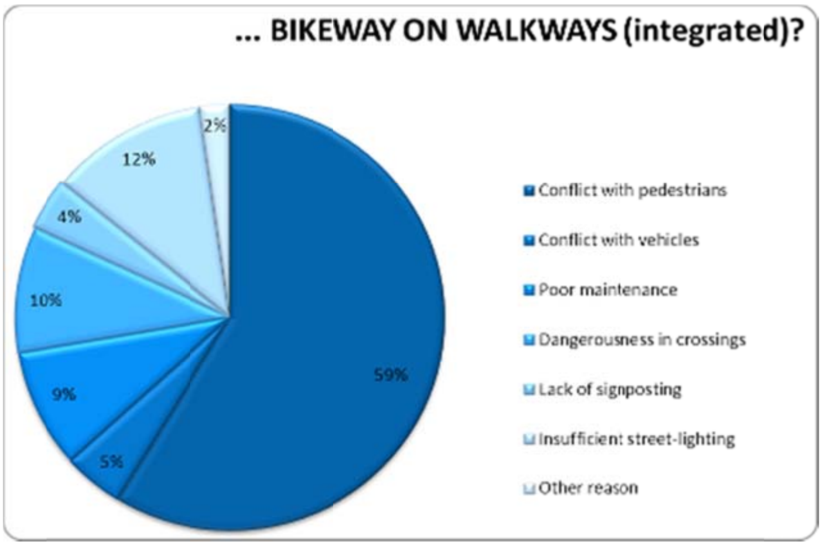


Figure 46 shows that the main reason that cyclists do not feel safe on an integrated bike path are, again, the conflicts with pedestrians but for integrated bikeways on walkways the percentage that have this view is higher at 59%. They feel that pedestrians do not give enough attention to cycle users on the walkway. Following the same pattern as the segregated bikeway responses, the next reason is the poor maintenance (dirt in many occasions) of the walkways and the conflicts that occur between vehicles and pedestrians at crossings. Some respondents complained that there is not enough signposting to clearly denote that the walkway is also an integrated bikeway. 12% stated that the street lighting wasn't sufficient; a number of the responses said that as they had to manoeuvre between pedestrians they needed brighter lighting. Some of the respondents complained about owners letting their dogs run free and getting in the way of them cycling. This issue with dogs off leash is also recognised on the above question regarding segregated bike ways.

The main reason that people do not feel safe cycling on shared walkways is the conflicts with pedestrians (56%), and the second reason is the danger on crossings (19%). A number of the respondents said that these conflicts occur because of the lack of respect for all users (bikes and pedestrians).

Respondents that ride on roads said the reason they do not feel safe is because they are afraid of vehicles and the conflict of crossings. Other reasons are the lack of signposting or poor lighting. The responses show that only expert cyclists ride on the roads, and they complain about the lack of knowledge of drivers and about how to manage the lack of respect drivers give them.

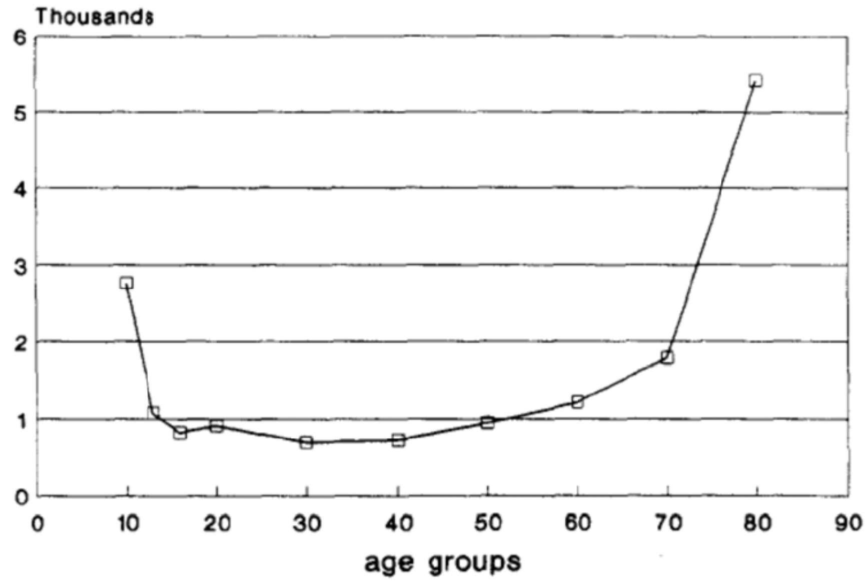
The results show that for trails and greenways cyclists still do not feel safe because of the conflicts with pedestrians (51%). This type of cycleway is mainly used for leisure and sport where all types of users can be found. The reasons of insufficient lighting and lack of maintenance is justified, as these lanes are usually a far distance from the city, and they are radials, so the maintenance is sometimes divided between different Councils, and in many cases it is not clear who is responsible. Another reason is owners and their dogs which cause obstructions. These types of cycleways are usually shared by pedestrians and people jogging, so the issues again focus on conflict and the respect between the different users.

Cycle Safety Equipment

Burgos, Spain carried out a study which investigates the effectiveness of safety equipment including cycle helmets and high visibility clothing for elderly cyclists. The Annual Statistical Report 2011 by the European Road Safety Observatory shows that during 2009 in Spain, 21% of cycling fatalities involved people over the age of 65. The percentage of the fatalities that occurred that year was primarily outside urban areas (77%), against inside urban areas (23%). The number of cyclist fatalities from 2000 to 2009 decreased by 32%.

The elderly and children are the most at risk age groups, particularly when cycling, as shown in the following figure (Maring et al., 1989).

Figure 47 – Accident Risk of Cyclsists in the Netherlands by Age Group, Per Billion Kilometres in 1983 and 1984.



The Maring et al. (1989) study shows that there are other aspects that should be taken into account when analysing elderly cyclist collsions:

- Deterioration of perceptual motor speed and cognitive development;
- Decrease in the level of knowledge about priority rules;
- High motivation towards rule compliance;
- A higher likelihood of being injured in a cycling collision.

Bikers over the age of 60 were three times more likely to be admitted to hospital compared with those in their 20s and 30s and two and a half times more likely to sustain a serious injury (Lever, 2013).

Cycle Helmet

While the effectiveness of bicycle helmets in reducing head injuries is debated world-wide, the protection offered by cycle helmets is crucial for all-aged cyclists because of the incidence and severe trauma associated with head injuries (Oxley et al., 2004).

Some regard bicycle helmets as a secondary safety intervention to road design (Mathieson, 1986), however, the published evidence shows that the use of bicycle helmets achieves substantial reductions in head, brain and facial injuries, (between 45% and 80%) and the most effective method to increase helmet use is through legislation (Macpherson & Macarthur, 2002).

Räsänen (1997) carried out a cycling safety study and found that based on the injuries sustained, the use of a bicycle helmet would have prevented the death to eight cyclists out of thirteen and injuries would had been prevented or less severe in 42% of the collisions.

The risk of head injuries is 1.72 times higher for cyclists not wearing a helmet than it is for cyclists who do wear a helmet. For brain injuries the risk is 2.13 times higher (Elvik, 2011).

The results of a study undertaken by Fyhri (2012), indicate that the introduction of mandatory bicycle helmet wearing will lead to a decrease of traditional cyclists in the cycling population, who do not have many collisions anyway, whereas those that already use a helmet and equipment will remain.

Oxley et al., (2004) state that there is little research regarding the age differences in helmet wearing rates and due to the different age classifications used by different studies, it is difficult to gauge and compare helmet use among elderly cyclists around the world. For example, in some studies, the highest adult age bracket can be listed as 40 years and older (e.g. Frith, 2000), 55 years and older (e.g. Rodgers, 2000), 65 years and over (e.g, Svanström et al, 2002) or classified as "adult cyclists" aged 18 years and over (e.g. Finch et al, 1993).

Moreover, the reasons for non-acceptance of helmet wearing are not well understood, it seems that there is a wide disparity in wearing rates even in countries where mandatory helmet wearing laws have been introduced, and that children and their parents are more likely to wear a helmet than teenagers and older cyclists.

Among teenagers, the problem is one of peer pressure and the fear of looking unfashionable, while for older cyclists it seems to be a problem of fear and misunderstanding about the benefits of head protection. For example, many older riders (ages not specified) mistakenly believe that they ride 'safely', the only real risk they face is being hit by a vehicle, and that in such cases they can, firstly, avoid a collision, and secondly, the helmet cannot provide protection (Henderson, 1995).

However, it still appears that helmet-wearing amongst the elderly is lower in countries that have not passed helmet laws in comparison to those that have. For example, in 1998 in Sweden (which does not have any helmet legislation), only 11.6% of elderly cyclists aged 65 years and over wore helmets (Svanström et al., 2002). In contrast, Rodgers (2000) reported that, in 1998 in the USA (in which 15 States had helmet laws in place), 43.4% of cyclists aged 55 years and over wore helmets always or almost always.

The cycle safety survey that Burgos undertook during August 2011, which is discussed in more detail earlier in this section of this report, asked what safety equipment cyclists wore on themselves and also what equipment they had on their bikes. The results are shown earlier in this section. This shows that 48% do not wear any safety equipment, 32% use a helmet and 50% use high visibility clothes. Regarding safety equipment for the bike a high percentage, 88% use a bell, and 67% use lights. People without a light may only use their bike during the day when there is enough light, which appears to be the case for elderly and retired people. 27% of respondents use a rear view mirror which they find very useful especially for riding on roads. The use of high visibility clothing is discussed below.

High Visibility Clothing

Fatality risks are substantially higher, not only for older cyclists, but also for males and for cyclists who ride in the dark (Rodgers, 1995). Night-time cycling is more dangerous than cycling in daylight. In a study of Swedish cyclists, 40% of bicyclist fatalities were reported to occur at night despite much lower exposure rates than in the day (Jaermark et al., 1991). That is the reason why high visibility clothing is one of the active safety measures considered in this study.

The visibility of cyclists is an important factor in crash risk. A high proportion of cycling fatalities are related to problems with frontal rather than rear conspicuity (Gale et al. 1998). Schoon (1996) noted that more than 30% of Netherland cycle crashes that occurred at night or in twilight could have been avoided if cycle lighting had been working and lighter coloured clothing had been worn.

Cairney (1998) investigated the visibility of different types of cycle lighting and found traditional battery taillights and, to a lesser degree, LED taillights failed to provide adequate levels of visibility. The performance of head-lights appeared even worse. Flashing lights in general provided better visibility. Again, while there is little evidence of age differences in cyclist visibility, it is noted that older adults tend to wear darker clothes, particularly in winter, which may reduce their visibility even further.

Wood (2012) carried out a cycle safety study and found that driver response rates to cyclists wearing a reflective vest alone were 38.4 metres whereas it dropped to 19.9 metres when cyclists wore black clothes. Wood found that the high visibility vest along with ankle and knee visibility straps was particularly effective in improving visibility if the cyclists did not have lights. Meanwhile, it is possible that cyclists who use lights may unknowingly put themselves at more risk by incorrectly believing that the visibility problem has been solved.

Cycle Training and Education

A five day bicycle training course was held in Burgos, Spain during 2011. A similar training course was held during 2010 and this report compares the two training courses. Both males and females were invited on the courses however only females attended. Eleven female participants took part in the workshops to learn how to ride a bike. The majority of participants had no experience with cycling before the workshop.

The age ranges for those taking part included 9 participants between 50 and 60 years of age, one participant was in her 60s and one in her 70s. The majority had no experience of cycling; only two of them had ridden a bike before and one used a bike occasionally. After the workshop was completed participants took part in a telephone survey about their satisfaction with the training course and how they have progressed after the course.

Bike Workshop
During the first day, participants tried to balance the bike using a variety of methods. Some of the balance methods involved; walking themselves forward whilst on the bike, balancing against a wall and using the trainer to hold the balance of the bike. These methods all helped them to grow in confidence.

Figure 48 & 49 – Burgos Bike Workshop

On the second day some of the participants started to ride alone. On the third and fourth days more participants started to ride on their own, while others were still practicing the exercises from the previous day. For the last day a bike tour on cycle lanes was organised and all of the participants took part in the tour and enjoyed the day.

Bike Workshop Survey Results
A questionnaire was completed by the participants of the workshops over the telephone, which gave a 60% response rate. A telephone survey was conducted in 2011 with the 2010 workshop participants and another was conducted in 2012 with the 2011 workshop participants.

The survey consisted of ten questions which included the following items:
- personal data: age, possession of bicycle, members of BiciBur (public loan bicycle scheme in the City of Burgos)
- use patterns and riding habits: frequency of use before and after the workshop, purpose of trips
- safety behaviour and risk perception: equipment they use and risks along the routes they choose
- satisfaction with the activity and suggestions

All the interviewees were women. The average age of respondents was 58 years old, three years older than the previous 2010 survey.

During 2011, 63.6% of participants after the workshop own a bike and 54.5% of riders report that they are members of BiciBur, the bicycle loan scheme in Burgos.

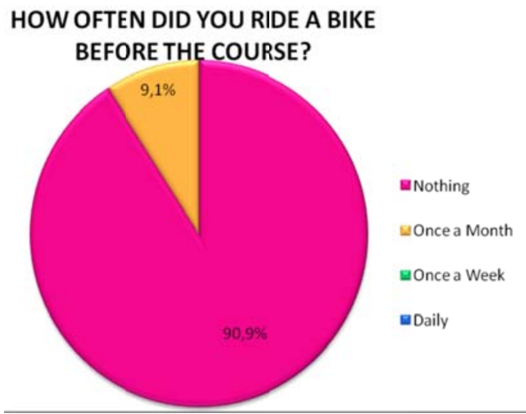
For 2012, a different question was asked to include the posibility of the participants having a bike at home and not necessarily being the owner of the bike. This question was included because many participants said that some of the bikes at their home had no owner as some members of the family had two or three bikes, or the bike was available as it was an old bike from another family member. From the question change this meant that the number of women without a bike was reduced from 45% to 18%.

The BiciBur card scheme used to be free but at the beginning of 2012 the Council started to charge a fee. This charge resulted in the number of BiciBur members dropping by 3000%, for the particpants of the workshop the trend continued with a drop of 9%. The drop in BiciBur membership is accounted to the fee applied to the scheme.

Figures 50 & 51: Mobility Patterns Before the Course

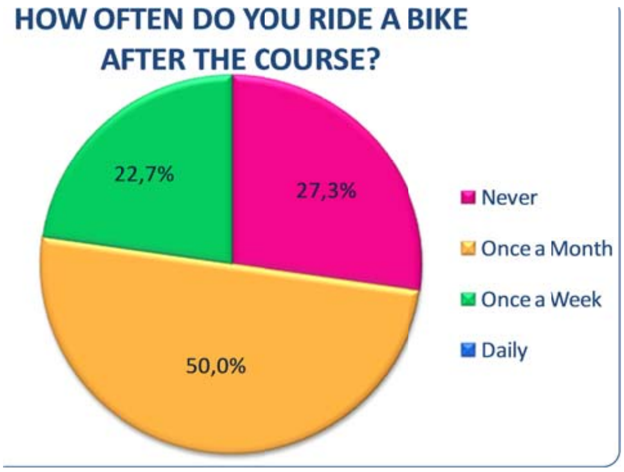
2011

2012

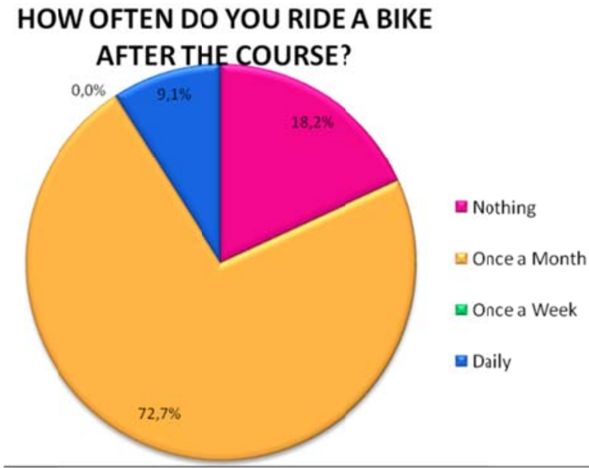


Figures 52 & 53: Mobility Patterns After the Course

2011



2011



A substantial amount of information from the survey provided details on bike usage patterns and riding habits. In 2011, 95.5% of participants had never ridden a bike before the course. The workshop proved to be a success as almost 73% of the participants ride a bike at least once a month after completing the training sessions. Nevertheless, no participants said they used a bike on a daily basis.

For the 2012 survey the percentage of people using a bike before the workshop was slightly higher (also the number of respondents was less). The results of the use after the course are also promising. The number of people who never use a bike is slightly less than the last year, the number of people using a bike once a month is higher and the results show a small percentage of people using the bike on a daily basis. Respondents said the use of a bike depends on the weather as they used a bike more often when there was good weather. They also said they mostly used the bike for leisure to ride with their family in the countryside or in green areas of the city.

Figure 54: Feeling Safe on Different Bike Lanes, 2011

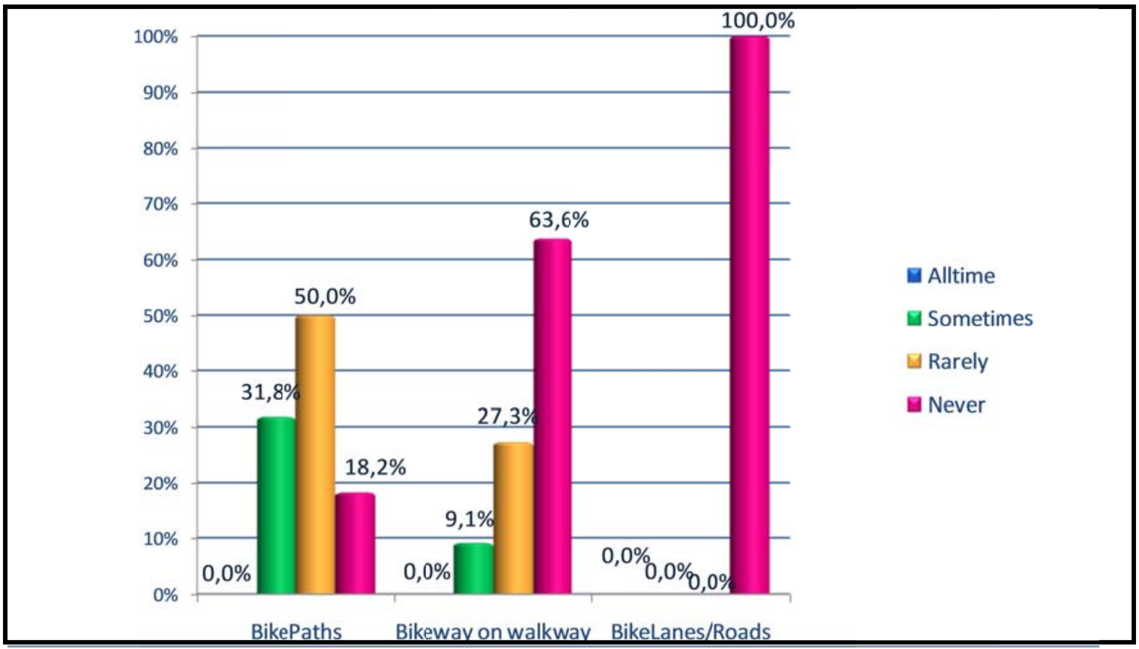


Figure 55: Feeling Safe on Different Bike Lanes, 2012

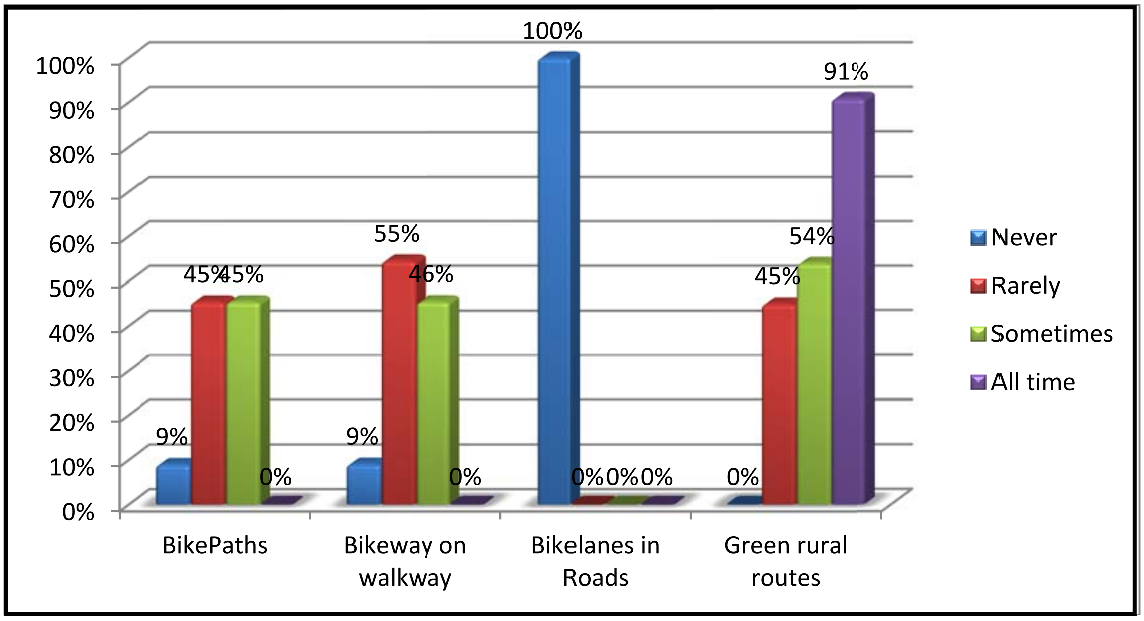


Figure 54 shows that in 2011, respondents were asked if they feel safe when they ride a bike on a:

- Bike-Path: most riders, 50%, indicated that they rarely felt safe during the trip.
- Bike-Way on walkway: the largest percentage of cyclists, 63.6%, never felt safe.
- Bike-Lane on Road none of the respondents had enough experience to feel safe when riding alongside other vehicles.

In 2012, the question was changed to include both bike paths in the city and bike paths in green/rural areas. The question was changed because the majority of respondents used the bike mainly in green rural areas. The results are shown below:

- Bike-Path: the results showed that some riders rarely feel safe and others only feel safe occasionally.
- Bike-Way on walkway: the percentage of cyclists who feel unsafe has decreased since 2011 and those who feel only occasionally safe has increased.
- Bike-Lane on Road: none of the respondents had enough experience to feel safe when they rode alongside other vehicles; the same result as the previous year.
- Green rural paths: most of the respondents felt safe using green rural paths; however a few did not feel completely safe. The presence of vehicles on the cycle path had a large effect on their answers.

Many respondents for both years say they would ride more if there was "someone to ride with", "safer places to ride", had "access to organised riding events" or took "another training course in bike riding". A respondent from the second year added the comment that, if there was another course they would feel more confident in busy areas, because they usually ride the bike in lightly trafficked rural areas.

All of the interviewees would recommend the workshop and they would take part in the training course again if there was another one proposed in order to progress their knowledge, confidence and safety. Nevertheless, no one from the 2010 training course attended again in 2011.

Conclusions

The following recommendations have been based on the results and the comments of the surveys regarding the training courses in 2010 and 2011 in the City of Burgos. Most of the participants completed the survey and a summary of the participants comments are shown below. However, some would not participate as they withdrew from the training course for different reasons, such as, illness or they were disappointed as they could not achieve the final objective.

- **Duration -** Five days is enough time to learn to ride a bike. Nevertheless, for some it may be beneficial to extend the course until they gain more confidence.
- **Methodology -** Participants liked the use of equipment to improve their balance before starting to ride alone. Participants liked the trainer checking how they were progressing on the bike.
- **Age -** Observations from the trainers showed that women in their 50s and below were easier to teach and learnt to ride more quickly than older participants, although some of the women over 70 learnt how to ride without any problem.
- **Frequency -** Two or three courses are needed to give confidence; there could be one every six months or one per year. Also, tours and events can be set up to encourage bike riding.
- **Bicycles -** The bike must be adjusted to suit the user. Bikes that are too big or too high are difficult for some people to ride.
- **Perceptions -** Bike paths in the countryside or further from roads or even on the pavement are perceived as safer. Attending only one training course did not give participants enough confidence to ride on the roads.
- **Atmosphere -** The family is very important to the participants; it is important that they offer support to the participant and also encourage practicing and accompany them on leisure rides. The family is the most important factor to promote bike riding practice.

- **Use -** It is very difficult to achieve good results with a one week training course. The main reason for participants using the bike after the course was for leisure reasons. However, this is a good starting point for the use of the bike and it is hoped they will progress onto using it for other purposes, such as, commuting.
- **Training Venue -** The training course must be held in a quiet location, away from pedestrians or vehicles. If at all possible, it is best to organise the courses for autumn or spring, when there is better weather for cycling.
- **Safety Elements -** In general, older participants tend not to use safety equipment as much as the rest of the population. Nevertheless, if the government implements new laws such as making wearing a helmet and high visibility clothing mandatory, older people will use it. Many of the participants did not see the necessity to use any safety equipment in safe areas such as the countryside.
- **Bike Availability -** Most of the participants owned a bicycle or they had use of one, which may have been handed down from another member of the family.

The main reasons why people do not feel safe on integrated or shared cyclepaths is because of the conflict with pedestrians and the lack of attention and respect for bike users. Nevertheless these types of cycle lanes are frequently used.

Regarding bikeways on the roads either segregated or integrated, the main reason why people do not feel safe is the presence of vehicles. They also do not feel safe at crossings because of the conflict with vehicles and pedestrians. A number of people complain about the lack of respect and the lack of attention from drivers towards cyclists; this is the main reason why people perceive on-road cycling as unsafe and only a few cyclists, mainly experts use roads. As people tend not to cycle on the roads, drivers are not aware of how to accommodate cyclists as they only come across them from time to time.

Around 45-50% of elderly cyclists do not use any safety equipment. The most commonly used safety equipment is helmets and high visibility jackets.

In relation with other studies and the SaMERU questionnaire, elderly people prefer to ride on separated bicycle lanes. This can be the reason of the poor use of safety equipment, as they feel safe and secure, they do not find it necessary to use any equipment in Burgos.

The city of Burgos has not got any data about the accidents suffered while riding on a bike, only those when a car has knocked down someone on a bike.

In the near future when the new laws to be introduced by the National Government come to fruition with the restriction of 30 km/h. Burgos travel patterns, will change cars will be more accustomed to share the roads with the bicycle.

Nevertheless, older people are likely to continue to use separated bicycle lanes. It will be necessary to promote the use of safety equipment even if cyclists try to avoid what they perceive as dangerous roads.

Actions 5.11-5.14: Mobility Scooters

A report has been produced which covers actions WP 5.11 – 5.14. This report includes research into mobility scooter vehicle types, current law, accident records and the mobility scooter questionnaire results. The full report is listed below and can be found on the SaMERU website.

WP 5.11, 5.12, 5.13, 5.14 - Mobility Scooters: Vehicle Types, Current Law, Accident Records and other Background Information regarding Mobility Scooters. (Southend-on-Sea, 2013).

Mobility Scooter Type and Law

In Italy, mobility scooters are ruled by the Article 46/1-b of the Highway Code. This suggests that mobility scooters are not considered a vehicle, but instead are termed a "machine" to be used by people with disabilities (like health devices). They are not considered as vehicles if their structural characteristics fall within the limits of the Article 196 Regulation. They can have a maximum length of 1.10 metres, maximum width of 0.7 metres, maximum height of 1.35m single seater, maximum mass of 40kg., maximum power of One kilowatt and maximum speed of six kilometres per hour. If these limits are exceeded then they are considered as vehicles and regulated as vehicles. Some exceptions are allowed through a Decree by the Italian Minister of Transport. (Automobile Club d'Italia, 2012)

In the UK, mechanically propelled mobility scooters are defined within The Chronically sick and Disabled Persons Act 1970 and the Use of Invalid Carriages on Highways Regulations 1988 which legally term them as an invalid carriage. The types of vehicles are shown below:

- Class 2 means a mechanically propelled invalid carriage which is constructed or adapted to be incapable of exceeding a speed of 4 miles per hour on the level under its own power.
- Class 3 means a mechanically propelled invalid carriage which is constructed or adapted to be capable of exceeding a speed of 4 miles per hour but incapable of exceeding a speed of 8 miles per hour on the level under its own power.

The Highway Code for Mobility Scooter Users (Road Safety GB, 2012) provides guidance on the laws applied to the use of mobility scooters. Class 2 vehicles have few rules regarding their use, there appears to be no age requirement for use and the rider is not required to hold insurance although this is strongly recommended. These scooters are not permitted for use on any road. Class 3 scooters must be registered with the Driver and Vehicle Licensing Agency (DVLA) and display a disabled category vehicle excise license. Riders must be over 14 years of age and physically disabled. There is no requirement to undertake training, hold a driving licence or have taken a driving test. These scooters may be used on footpaths or roads however when used on a footpath, the speed limiting switch must be activated to ensure a maximum speed of 4mph. The scooter must not weigh more that 150 kilograms without the driver or any load. The scooter must be fitted with a speed indicator and the riders view of the speed indicator must not be obstructed.

When used on a road, the Road Vehicle Lighting Regulations (HMSO, 1989) states that the scooters must comply with vehicle lighting rules as if it were a motor vehicle and have headlamps, rear lights and indicator devices. The scooters must be fitted with a rear view mirror and an audible horn.

The current UK legislation regarding mobility scooters for each vehicle class is shown below:

Table 34 – Summary of Current Mobility Scooter Leglisation in the UK (Invalid Carriages)

Vehicle Class/Key Legal Advice	Class 2 Mobility Scooters (Invalid Carriages)	Class 3 Mobility Scooters (Invalid Carriages)
DVLA Maximum Permitted Speed	4mph (6.4 km ph)	8mph (12.8 km ph)
Permitted on pavements?	Yes – but maximum speed is not recommended in heavily pedestrianised areas.	No
Permitted on Roads?	Only to cross.	Yes (see exceptions below)
Is a driving licence required?	No	No – but drivers must obey the Highway Code at all times.
Eyesight tests	Recommended.	Must comply with relevant eyesight requirements.
Alcohol and Drugs	Not recommended.	Must not be driven under the influence of alcohol.
Motorways, bicycle tracks, bus/cycle lanes	Not permitted	Not permitted
Dual Carriageways	No	Yes, legally allowed but not recommended (using flashing beacon).
Special Fittings	Special fittings not required.	Class 3 must be fitted with the following: Lights, indicators, horn, rear view mirror/rear reflectors. A flashing beacon is recommended for use on the road. Flashing Beacons MUST be used on dual carriageways.
Insurance	Not legally required but public liability insurance is recommended to cover accidental damage to other people and property.	
Additional Information	Leaflet V100 – available from larger Post Offices or the DVLA	

During the SaMERU project Southend-on-Sea Borough Council worked closely with Mobility 4U, a local business that provides all types of mobility equipment. Mobility 4U provided a report on the Provision and Use of Mobility Scooters and Accessories (Wates, 2012), which concludes that people do not always buy the most appropriate mobility scooter because not all retailers are responsible. In addition, the report considers there is a lack of legislation regarding the use, sale and maintenance of mobility scooters. There is no requirement for a user competence test and no requirement for the vendor to ensure the user has been appropriately trained to use the vehicle. There is no requirement for the user to insure the machine. The government only advise that it is good practice to insure the vehicle and retailers should provide the information regarding insurance.

The report recommends that the Government, Police and national safety organisations should be seeking to develop legislation that ensures the following:

1. There is a mandatory requirement that retailers must provide written proof that every scooter sold or hired has been tested and is mechanically sound.
2. Every new user has a mandatory induction/training course with appropriate accreditation which ensures that the user understands the relevant law and that they fully comprehend the machine including the motor brake.
3. All users should have a health check which ensures their vision, hearing and mobility is adequate to ensure the safe use of the vehicle.

In addition, retailers should be working in association with the relevant organisations such as DIAL (Disability Information and Advice Line services) to ensure people buy the most appropriate vehicle for their needs and abilities.

Mobility Scooter Users Questionnaire

Southend-on-Sea Borough Council supplied a questionnaire to people who currently use mobility scooters to seek their views on how they use them. A copy of the questionnaire can be found on the SaMERU website.

Current ownership of mobility scooters in Southend-on-Sea is quite low, however numbers of people using mobility scooters are growing noticeably. There are no official figures regarding the current number in use and as described in Table 34 not all vehicles have to be registered. 26 specific mobility scooter questionnaires were filled in.

The key findings from the questionnaires are as follows:

- The majority of users have owned their mobility scooters for five years or more. They use it regularly, either two or three times a week or every day.
- Mobility scooter users responding to the questionnaire will generally travel up to a mile or more. The most popular time for using a scooter is in the morning.
- The majority of the respondents use a standard four wheel scooter.
- Baskets and mirrors are the most popular accessories for the scooters.
- The age of respondents was evenly spread from 50 up to 89. Three respondents did not provide their age.
- 51% said that they used their mobility scooter for shopping (70% of these respondents were females). 19% used their scooters for pleasure for example, to see a show. 14% of the respondents said mobility scooters were simply to help them be mobile and travel about. 9% of the respondents used the mobility scooter for visiting the doctor and/or hospital and 7% used them for visiting people. These results show that mobility scooters play an important part of these people's lives. However, the average age of respondents who provided their age was only 68.

There were questions regarding mobility scooters in the postal questionnaire. The results to these questions can be found under WP1 Action 1.3 the report titled SaMERU Postal Questionnaire.

Accidents Involving Mobility Scooters

Mobility scooters are not highly used in the cities of Burgos and Modena so there was no accident data for mobility scooters from these countries. However, mobility scooter use in the UK is increasing and therefore the below information refers to Southend-on-Sea and Lancashire's research on mobility scooters.

Southend-on-Sea
A review of accidents in Southend-on-Sea was undertaken for the period 2006 to 2010. The results of this analysis can be found in the report titled WP 2 – Older Road Users in Southend-on-Sea – Accidents/Casualties 2006-2010. This analysis did not identify any accidents involving mobility scooters. However, the data did identify accidents involving 'other' vehicles. A more detailed analysis of this data showed that mobility scooters can sometimes be identified but the recording of such vehicles is not consistent which means it cannot be assumed that all other vehicles are mobility scooters.

A detailed analysis has been undertaken of all the accidents that are likely to have involved mobility scooters in the period 1st January 2000 to 31st December 2012. A total of 21 accidents that most probably involved a mobility scooter have been identified.

Situations for the accidents included cars reversing onto the highway, car doors opening over the pavement and a car turning right. There was no clear trend to the cause of the accidents. Just over half the accidents (57%) were caused by a car or other vehicle. The remainder of the accidents were caused by the mobility scooter.

The average age of the drivers was 79. 81% were females and 19% males where there age was provided. All but one accident occurred when it was fine and dry. All accidents occurred during daylight hours. There was no obvious pattern regarding the day of the week. 48% of incidents occurred at some sort of highway junction, for example, crossing a side road or the exit to a facility such as a car park. Only 14% of accidents were on footways. 29% of accidents were on some sort of pedestrian crossing but the mobility scooter was at fault in 4 of the 6 accidents.

In 2000, ownership of mobility scooters was low in Southend-on-Sea. However, the number of mobility scooters has been increasing in the last few years and therefore it had been anticipated that the number of accidents would have increased. Mobility scooters are much more frequently seen on the street and there are now several mobility scooter outlets in the town. The data reviewed suggests that the number of accidents has been falling but with such a small sample it is not a statistically reliable statement.

Lancashire
Lancashire obtained an accident report listing accidents that had involved mobility scooters in Lancashire from January 2007 until June 2012 inclusive.

In Lancashire only 25 accidents were recorded during this five and a half year period. With so few accidents it is difficult to identify clear patterns. However, more accidents occurred on Mondays to Thursdays. There were more accidents recorded in July and August and there were no accidents recorded before 10am or after 9pm.

72% of the accidents occurred on the highway. In 44% of the accidents the car was at fault and 44% the mobility scooter was at fault. In terms of causes of accidents with car drivers it would appear to have been lack of observation particularly when reversing vehicles. For mobility scooters a lack of observation seemed to apply to many of the accidents.

Conclusions

It is important to monitor the ownership of mobility scooters as there is currently no comprehensive legal requirement to register all these vehicles.

It seems probable that the level of ownership of mobility scooters will continue to increase, particularly as mobility scooters have low running costs compared to cars. It also seems likely, therefore, that accidents involving mobility scooters may still increase. Accidents should be monitored and the police should be encouraged to identify these vehicles when recording accident details.

As the use of mobility scooters increases it will be important to encourage the safe and appropriate use of these vehicles. Tests for health checks and mobility scooter training may both be important pre-requisites to people taking on these vehicles. It will also be more important for highways and buildings to be designed to accommodate mobility scooters in the future.

In association with retailers the Government, police and national safety organisation should be encouraged to develop legislation that ensures the following:

1. There is a mandatory requirement that retailers must provide written proof that every scooter sold or hired has been tested and is mechanically sound.
2. Every new user has a mandatory induction/training course with appropriate accreditation which ensures that the user understands the relevant law and that they fully comprehend the machine including the motor brake.
3. All users should have a health check which ensures their vision, hearing and mobility is adequate to ensure the safe use of the vehicle.

In addition, retailers should be working in association with the relevant organisations to ensure people buy the most appropriate vehicle for their needs and abilities.

Work Package 6 - Marketing Training & Awareness

Action 6.1-6.6: Publicity and the Media

Street Events in Southend

Several street events were organised to promote the message that elderly road users require consideration and courtesy, especially from drivers. In order to generate maximum impact it was decided, where possible, to hold these events at locations where other large scale community activities were taking place that were likely to attract significant numbers of people.

15 October 2011,	Victoria Shopping Centre.
01 October 2011,	Victoria Shopping Centre. The Safer Use of Mobility Scooters. A joint event held with Southend's Older People's Assembly.
05, 06, 07 May 2012,	Southend Garden Show.
01 November 2012,	Mobility Scooter Awareness Day. A joint event held with Essex Fire and Police Services Community Wheels, Mobility 4 U and Disability Essex.
08 December 2012,	Drink/Drug Driving campaign. A joint event with Essex Fire and Police services.

At these street events, the Southend Road Safety Team provided:

- A booklet entitled, 'The Older Person's Guide to Road Safety'.
- The SaMERU Road Safety Bag containing information on road safety and details of other road safety promotions.
- The Highway Code for Mobility Scooter Users produced by the Department for Transport.
- A questionnaire on mobility issues for the elderly
- A questionnaire for mobility scooter users

The street events provided an opportunity for elderly residents to understand more about how they could improve their own road safety and reduce the risk of a collision as a driver, cyclist, or pedestrian. They also helped to foster a culture of respect towards the older road users amongst younger people.

Public Relations

More than 3000 copies of the Older Persons Guide to Road Safety have been distributed to doctors' surgeries, libraries and day centres in Southend. (Road Safety Great Britian, (2011)

Two Newsletters have been produced and a brochure summarising the findings and recommendations was distributed at the SaMERU conference in March 2013.

Action 6.7: Review Training and Awareness Workshops in the SaMERU Partner Countries

Summary

This review examined education and training workshops delivered to older people, with an emphasis on transport, travel and road safety in the partner countries involved in SaMERU.

Public transport, road safety, driver, cycle and walking training schemes aimed at older people were the main areas of focus. Non-transport related training schemes were considered with a view to assessing the potential for either utilising successful delivery methods or incorporating transport and road safety messages into future courses.

Many transport workshops exist in Europe across SaMERU participating nations with the aim of increasing sustainable transport usage and promoting road safety for older people. Several of these schemes have been analysed in order to draw conclusions and make recommendations.

The UK has many training schemes focused on driving, whereas the other European countries have a greater focus on promoting public transport and road safety training.

All the courses reviewed can be used and adapted to be run in any EU country. They all prove a successful marker for helping older road users to carry out their daily activities with ease and confidence. It is important for older people to have an active and social lifestyle, and the availability of well-designed and targeted training in the use of a variety of travel modes is a key factor in maintaining lifelong independence.

Conclusions

The workshops and training have shown that:

- There has been a widespread lack of formal evaluation of training and awareness workshops.
- Many schemes that have succeeded in the short term have not been extended beyond an initial pilot.
- Lack of attention to effective recruitment has resulted in poor take up of courses and events.
- Training and education projects having high take up following an initial launch, have often failed to maintain momentum.
- Participants with the greatest enthusiasm for attending a training course may well not be those who would benefit the most from it.
- In most cases, courses have been designed and implemented without on-going review of content and effectiveness.
- There is potential to incorporate road safety and transport messages into existing schemes.
- Older people may not identify themselves by age group and may reject a course targeted at "older" people.
- Public transport training schemes involving peer-to-peer mentoring appear to be the most successful.

- Workshops are more successful where consideration has been given to local demographics, geography and infrastructure.
- Awareness and training interventions are more positively received when delivered at an appropriate time of life such as following life changing events, for example retirement or bereavement.

Recommendations

- Formal evaluation of training and awareness workshops should be a mandatory requirement of grant funded projects.
- Attention should be given to long term sustainability of pilots which prove to be successful.
- Attention should be given to long term, targeted and effective recruitment to maintain a high level of awareness and attendance.
- Ensure that participants with the greatest need for training and awareness programmes are approached by enlisting the support of partners such as healthcare professionals and the voluntary sector.
- When delivering training and awareness schemes a programme of continuous improvement should be implemented to ensure effectiveness.
- Wherever possible road safety and sustainable transport messages should be incorporated into existing events and/or training schemes targeted at older people.
- In order to ensure the greatest uptake of training and awareness schemes by older people courses should be offered to the greater population and not marketed to a specific age group.
- Training and awareness events should consider the psychological as well as physiological barriers to safe and sustainable travel.
- Volunteer peer-to-peer mentors should be utilised whenever possible.
- Training and awareness workshops should be tailored to the location and population in which they are delivered.
- Significant changes to the highway should be considered as a trigger for offering training and awareness events. Similarly, training should be offered at key points in a resident's life such as at retirement.

Introduction

As cities in Europe get busier and the average life expectancy increases, schemes offering guidance and support on public transport for older people are increasingly necessary. Encouraging older people to use sustainable transport through these initiatives will improve their health and well being by improving mobility and reducing dependency on private transport. A numer of examples of training and awareness workshops are summarised below.

Methodology

Desk-based research was conducted over a six month period between September 2012 and February 2013 to identify training courses, workshops and events designed for a target audience aged 50 plus and delivered at any time during the past 10 years. Both on-going and discontinued courses were included.

Public transport, road safety, driver, cycle and walking training schemes aimed at older people were the main areas of focus, with non-transport related training schemes considered with a view to assessing the potential for either utilising successful delivery methods or incorporating transport and road safety messages into future courses.

1 - Public Transport Training

Mobility Training to Becoming Independent Travellers (Leeds, UK)

Aim

To offer one-to-one support to clients with physical and sensory impairments, learning disabilities and others who lack confidence in using public transport services in Leeds.

The Course

A "Bus Buddy" scheme fully funded by the Department for Transport's Urban Bus Challenge, and in partnership with local operators, local authorities and the community (Leeds Alternative Travel, Leeds Social Services and the Transport Action Group). The support gradually reduces as they gain greater confidence.

Outcome

The success of this scheme is due to the volunteer mentors being of a similar age and able to promote bus buddying effectively within their own age group. It has also shown that bus buddying has increased older peoples use of public transport from constant feedback from users allowing for continuous development to improve the service.

Adapting Public Transport for Older People (Donostia-San Sebastián, Spain)

Aim

This course aimed to encourage and increase the use of public transport amongst older people.

The Course

It offered instruction on understanding bus timetables, guidance for travelling around the neighbourhood and safety tips while onboard. To support the activity the Public Transport Company (CTSS) are currently training the 350 bus drivers of the dBus company on older people requirements. The scheme could be divided into three different parts: instruction about how to understand the information provided in bus stations; instruction about how to manage inside the bus; and a guided bus trip round the neighbourhood.

Outcome

The scheme was a success with a good number of the 149 participants attending the seven workshops. Positive feedback was received from the post questionnaires. A suggestion taken from someone who took part stated that it was really useful and that they would use public transport more frequently since participating. Due to the success similar activities will be continued to be offered.

"Compagnons du Voyage" (Paris, France)

Aim

To enable older people to remain mobile and to gain greater dependence on public transport.

The Course
The scheme has run in Paris since 1993 and so far one million people have taken part. The scheme offers travel safety tips, guidance around the city and an explanation of the basics of public transport.

"Seniors Train Seniors" (Offenbach am Main, Germany)

Aim
This initiative aimed to teach older people how to use buses and trains.

The Course
The initiative in Offenbach am Main trained older people, teaching basic skills such as purchasing a ticket, getting on and off a train safely and using the right connections. As a result of this scheme 200 older people have been trained in safe transport usage.

Outcome
The scheme will continue despite the initial pilot project ending.

Paten Ticket Scheme (Cologne, Germany)

Aim
To encourage older people to develop new transport habits.

The Scheme
Season ticket holders in Cologne are given a free three month ticket to give to a friend or relative who is a non-frequent public transport user.

Outcome
The success of this scheme was measured by the purchase of season tickets by 30% of participants.

BAIM Plus Scheme (Frankfurt, Germany)

Aim
To improve older people's mobility through the provision of information.

The Scheme
The City of Frankfurt ran this scheme in order to offer barrier-free travelling by providing route planning and making destinations accessible to all.

Outcome
The outcome was an enrichment of passenger information systems throughout public transport.

Both the schemes in Cologne and Frankfurt received positive feedback and a good number of participants turned out making them a success.

Training of Older Passengers (Essen, Germany)

Aim
To increase customer loyalty and respond to the needs of older people regarding safety, security, service quality and communication.

The Course
This scheme was run by Essener Verkehrs-AG (EVAG) (Public Transport operator in the City of Essen, Germany) in 2006 and introduced training sessions and workshops for older passengers focusing on mobility and transport.

Outcome

To date, the passenger training has not been evaluated, so there is no data on the impact regarding safety and customer loyalty. EVAG however sees an added value in terms of a better image of public transport among older passengers. The demand is increasing, from four events per year in the beginning to monthly events today. The user feedback is very positive, only few people use these events to complain about public transport.

Safety for Elderly People (Zagreb, Croatia)

Aim

In Zagreb (Croatia) public transport has a number of events aimed at improving the safety and reliability of public transport for the elderly and to improve understanding among staff of elderly people's needs.

The Course

Zagreb City invited older people to discuss their views and opinions in which public transport operators could act upon and start removing barriers that affect older passengers. This led to a driver training scheme for older people who then had the opportunity to discuss their habits and needs in moving through the City, as well as challenges and difficulties they face in using public transport and other mobility modes. Bus and tram drivers of Zagreb Electric Tram (ZET), the local public transport operator, and traffic police were available at the workshops which gave the older people an opportunity to have a chat with them. Many proposals, objections and recommendations were collected, and then passed on to relevant authorities. A training session for older people on the safer use of public transport was held at the ZET Terminal. Participants took part in all aspects of safe public transport use, from getting on and off a public transport vehicle, to moving safely within it and using e-tickets.

Outcome

Seventeen workshops were held with a total of some 500 senior participants. The seniors showed appreciation for the workshops, in particular emphasising that they were grateful for the attention given to them. They also spoke positively about the new low-floor trams and buses as well as real-time displays at bus stops. They found the brochure with practical advice for seniors in public transport, which was the first of its kind, highly useful. They also had the same opinion of the Alojz and Vlatka video. In co-operation with the Zagreb Cinema Club, a short promotional video, entitled Alojz and Vlatka, was made on safety and movement of seniors in public transport.

Be Safe by Bus (Saltzurg, Austria)

Aims

Figure 56: Be Safe by Bus (Saltzburg, Austria)

- To reduce the number of accidents on public transport;
- To make public transport easier for older people to use;
- To keep older people as public transport users; and
- To raise awareness of the needs of older people as public transport users.

This will lead to helping older passengers gain confidence in using public transport and thus retain their mobility.

The Course

This is an ongoing course run by the local transport operator (StadtBus) Salzburg AG and the Zentrum fuer Generationen & Barrierefreiheit (Centre for Generations & Accessibility) in Austria with the support of the AENEAS project. It started in September 2004.

Figure 57: Stadt Bus in Austria

The course consists of two units completed over two consecutive days in order to avoid tiring participants. The day's activities are printed so they may be reviewed in the evening. This helps make the practical session on the second day more effective. On day one, practical aspects are covered and on day two, the training focuses on implementing what has been learnt in real-life situations.

Outcome

The course not only received positive feedback from users, but has also attracted international attention from others that want to learn from these experiences. The concept has been constantly refined over time.

2 - Driver Training

Somerset Older Driver Training (Somerset, UK)

The Somerset Road Safety Partnership organised a safety course that helps older drivers. It was set up as a consequence of the increasing numbers of fatalities involving drivers aged over 60. The course is free and open to drivers over 60. Participants had the opportunity to drive with a qualified instructor and discuss the areas of their driving that needed improvement.

Route 60+ (Somerset, UK)

This is a fifty minute presentation aimed at ages 60 plus. The aim of the event is to address how vehicles over time have changed and how, over the years, everyone's driving skills and habits may have also changed. The event offers the opportunity to talk to police officers, fire-fighters and members of the road safety team. Materials given out to those that attend the event include a high-visibility jacket and a copy of the Highway Code.

GOLD: Guidance for the Older Driver (Norfolk, UK)

Aim

To provide drivers with the support they need rather than to stop them from driving.

The Course

Norfolk County Council, partnered with the Department for Transport run this course for people aged 55 and over to help them continue driving for as long as it remains safe to do so. GOLD is designed to help reassure drivers, offers driver development sessions to help refresh skills, increases confidence and provides guidance on how to maintain safe driving to reduce risk to all road users.

Figure 58 - Carol Bundock - Norfolk's local TV presenter

Outcome

Up until 2009, 96 people had participated in GOLD; 20% of whom had come via medical referrals. Approved Driving Instructors (ADIs) took older drivers on in-car assessments. It was decided that ADIs would write up feedback after the assessment, so as not to increase any confidence issues. One challenge identified was how to promote the scheme in order for it to reach and encourage the relevant people who may be less confident to take part.

SAGE: Safer Driving with Age (Gloucester, UK)

Aim

To provide older drivers with the support, guidance and coaching necessary to continue driving for as long as it is safe to do so.

The Course

This scheme is provided by Gloucestershire County Council. Sage can also be adapted to those who feel they need a refresher, for example, for those who are returning to driving after a period of illness. The 1 hour driving assessment takes place near the driver's home in their own car and on roads they are familiar with. It allows the driver to discuss their performance with the driving assessor as the drive progresses. The course costs £30. Sage is also run by Leicestershire County Council and costs £25.

Outcome

The scheme was the focus of part of a BBC1 television documentary filmed in the Cotswolds in December 2008.

Driving Safer for Longer (DSFL) (Devon, UK)

Aim

To help older drivers drive safely for as long as possible.

The Course

A two hour workshop for older drivers providing important information covering the following areas: driving, health, medicines and car dependency. Promotion was carried out through local social groups, e.g. Age UK (formerly Age Concern), and by Devon County Council in partnership with Devon and Cornwall Constabulary. The DSFL courses have been running since summer 2008. Training films were provided including information on speed limits, right turns, night driving, roundabouts and motorways.

Outcome

The University of Plymouth and Devon County Council collaborated to evaluate the effectiveness of the workshops, which were attended by 161 people (103 male, 50 female, 8 unknown), all of whom were asked to complete an evaluation questionnaire before and after the workshop. It was found that the workshops increased older people's driving-related knowledge and their knowledge of how to access support. It was considered that more video clips and information prior to the workshops would be useful. Feedback questionnaires were completed immediately after the workshop but it is not known how long the increase in knowledge and the intention to act upon it will last. A three month follow-up was decided upon to gauge whether the knowledge gained had been retained. Overall, the evaluation has shown that the DSFL workshops are successful and are an effective tool for improving older people's driving and updating their knowledge.

Drive 55 Plus (Dorset, UK)

Aim

The course is designed to refresh and update driving skills and knowledge, and how to deal with ever changing road conditions, by addressing the most common causes of collisions in Dorset. These are a lack of hazard awareness and driving at inappropriate speeds.

The Course

This refresher driver training programme is a joint casualty reduction initiative between the three local authorities in Dorset. The course was part of a pilot scheme and was free to attend. The three hour course involves group discussions on new driving techniques, changes in the law and Highway Code, keeping fit to drive, motorways and roundabouts. The course was very popular and advance booking became essential. A practical driving refresher course was also available free of charge.

Outcome

These courses are still running but with a charge of £5 for each course.

Older Driver Refresher Training (Hertfordshire, UK)

The Course

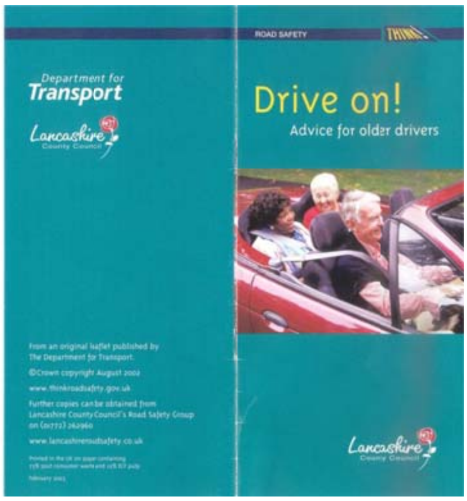
Hertfordshire Council provides this training for drivers aged 70 and over. The 2-hour practical driving session is committed to helping older people retain independent mobility whilst remaining safe on the road. The course costs £10.

Drive On (Lancashire, UK)

The Course

Developed and delivered by Lancashire County Council approximately 10 years ago (2003). The Drive-On course was available to older drivers who wished to address their driving concerns or refresh their skills. This was a two-hour course that was delivered on the road, with the content tailored to meet the needs of each driver.

Figure 59 - Drive On! Leaflet



This course had initially been well received by participants, and was still available to residents of Lancashire in 2010. Take up in recent years however had been extremely low due to a lack of public awareness.

The course was accompanied by a booklet "Drive On! Advice for older drivers", published by the Department for Transport. Although the booklet contained useful advice still relevant in 2013, it is unfortunately no longer available.

Driving Advantage (Hertfordshire, UK)

Aim

The course is aimed at drivers aged 60 and over to help them cope with modern traffic and road layouts and improve confidence in order to get around easily and safely.

The Course

Driving Advantage is provided by Hertfordshire County Council and is a one-day workshop providing support for older people to continue to drive safely in their later years. The course includes:

- A mobility exercise session with a physiotherapist
- Concentration exercises
- Coping with tiredness and fatigue
- Practical aids to driving
- Health issues
- Eyesight and medication issues
- Reverse parking techniques
- Eye sight and reaction timer tests
- A Highway Code quiz.

The workshop is designed to allow group discussions and for attendees to share their problems and experiences. A week or two after the course, the local group of Advanced Motorists offers a one-hour assessment drive in the particiapnts own car. This helps to support the workshop attended and to review any issues they may still have or put into practice anything they have learnt.

'Altere aktive Kraftfahrer' (Germany)

Aim

The course offers older drivers the opportunity to keep up-to-date with the latest driving regulations, and addresses any individual problems.

The Course

This is a driver training programme which consists of four successive seminars that are run in the style of a workshop. Participants are encouraged to examine their own behaviour and driving habits behind the wheel, by discussion and the sharing of experiences.

BROEM-drives (Netherlands)

Aim

To provide refresher information for drivers aged 55 and over.

The Course

This initiative is available in the Netherlands and helps to update older people on changes to traffic legislation and road layouts. It also helps to increase their confidence. The voluntary drive includes assessment of driving style, eyesight and response times and provides a refresher course on traffic regulations. The drive is supplemented by a reference book which includes information on the effects of age on driving and gives helpful advice to older drivers. After the drive, the participant is given a report indicating their strengths and weaknesses, with suggestions for improvement.

*** Drive Safer for Longer (Metropolitan Borough of Dudley, UK)**

Aim

To promote road safety to older drivers with the aim of making roads safer for everyone.

The Course

A road safety course for older drivers is being run across the Black Country by the Metropolitan Borough of Dudley, with support from Walsall's Road Safety and Travel Awareness Team. The courses started in April 2013. The workshop will help improve road safety, confidence, awareness skills and refreshed knowledge of the Highway Code.

* Implemented post Lancashire SaMERU pilot

3 - Cycle Training

Figure 60 - Crank it Up logo

Crank it Up (Yorkshire, UK)

Aim

Crank it Up Cycling For All is a voluntary project which provides cycling for all people of all abilities.

The Course

Cycling sessions and training are provided for the non-cyclist, leisure cyclist, disabled and older person, including fun sessions and cycle maintenance.

Cycling for Older People (Cardiff, UK)

Aim

To promote cycling amongst older people and to provide free courses in order to increase older people's cycling and maintenance skills.

The Course

This course is funded by the Cardiff and Vale University Health Trust and Cardiff Council in order to promote cycling amongst older people. Topics available to participate in:

- Learn to ride.
  As a way of improving fitness and in turn health, as well as enjoying yourself and having fun.
- On-Road Cycling
  If you are unsure about cycling on the road, this course will help you to build on your confidence and skills to become more aware on the road.
- Cycle Maintenance
  A two and a half hour course providing you with all the information and practical skills you need to keep your bike safe and in working order.

- Cycle Leadership
  Learn how to prepare for and deliver a group ride.

Silver Cyclists (Bristol, UK)

Aim

Life Cycle UK organises bicycle rides for people aged 55 and over. The rides give older people a chance to get out, exercise, discover their local area by bike and socialise with similar minded people within their age group, with a focus on having fun.

Figure 61: Silver Cyclists in Bristol, UK

The Course

Silver Cyclist rides are based in local communities in and around Bristol. Friendly ride leaders use traffic free and low trafficked routes. The course includes visits by bike to places of interest and occasionally a wildlife or local history expert is present to talk about the local area.

Bike Right (Manchester, UK)

Manchester is committed to making cycling viable, safer and better for everyone. Free adult cycle training, coaching, and maintenance courses are available to all.

Purrfect Pedalling: Training for People Returning to Cycling (Midlands, UK)

Aim

To encourage people to return to cycling and provide reassurance for participants that they can build on their confidence and make cycling feel less daunting and more enjoyable.

The Course

One-to-one training is provided to enable older people to learn at their own pace, allowing them to focus on their individual needs. The training may include a particular route the older person wishes to regularly take. This will benefit older people greatly because they may refresh and apply cycling skills they have not have used for a while, in safety on or off the road.

Cycling Safely Into Later Years (Munich, Germany)

Aim

To keep older people active, improving health and wellbeing and to promote sustainable travel within an age group that typically travels in cars.

The Course

Cycling as a method of sustainable transport for older people has been encouraged in Munich. Supported by the municipality, the Munich environmental Non-Governmental Organisations (NGO) Green City developed cycle training especially for older people in 2006. The local police lead the training sessions on road safety. This is followed by a physiotherapist who discusses the age-related health issues and demonstrates simple exercises one can achieve to keep fit for cycling. After this, the participants are able to try the specially adapted bikes.

Outcome

The average age of the participants was 69, with more men taking part than woman. This measure can be easily transferred to other cities. One point that can help with older people's fears of cycling is the state of the cycle paths and roads. It would therefore be helpful if the city providing the training had well maintained cycle paths and roads.

4 - Walking Training

Age UK Walking Groups (Cheshire East, UK)

Aim

Walking groups are an excellent way of promoting walking. It's a great way to stay active, keep healthy and enjoy the beautiful scenery with like-minded people.

Groups

The scheme is run by Cheshire East Age UK. There are nine groups that meet up once or twice a month to enjoy gentle, local walks or more advanced rambles that could take you anywhere in Cheshire East. All walks are led by trained leaders and have been assessed as suitable terrain for your safety. A walking programme is supplied with 131 walks available throughout the year in locations such as Bollington, Congleton, Holmes Chapel, Knutsford, Macclesfield, Poynton and Wilmslow. An annual registration fee to take part in the walks costs £15 and allows access to the walk programme.

Promote Walking Among Older People (Donostia San Sebastián, Spain)

Aim

This course aimed to promote walking among older people in Donostia San Sebastián.

The Course

Twenty walking workshops were organised by AENEAS. Excursions were designed with the thought of having more interesting routes than the usual ones normally taken. With this in mind, Club Vasco de Camping was approached and provided many ideas and much support.

Figure 62 - Walking Workshop in Spain

Outcome

More than 60 people, up to the age of 85, took part in each activity and participated in the excursions. However, it was difficult gaining access to groups of people aged between 50 and 60. With each excursion new people joined in the activities, which made up for the few who dropped out, so there was a stable group of people attending almost the whole programme. Walking has always been a very popular activity in Donostia San Sebastián. It was found that most people taking part in the activities were regular users of sustainable transport, with many using public transport as their normal mode of travel. Driving a car was viewed as an impractical way of moving around the city and its surrounding areas. Walking and public transport were considered the best options. However, cycling was viewed differently and found to be more of a sporting activity amongst men at the weekends.

Figure 63 - AENEAS Walking Group

Walk and Talk (Odense, Denmark)

Aim

The aim of the project is to increase older people's motivation to walk, strengthen their social relations and hold on to good walking habits.

The Course

This is a pilot walking project started by two health professionals in Odense, Denmark as part of an education programme to promote healthy activities for older people. The activities are designed for both active and less active older people and the walking trips can be adjusted in both length and speed to suit individual needs.

Outcome

Although the project started in a small area of Odense, the intention is to implement it in other areas. This will happen in co-operation with volunteers, organisations and employees of the City of Odense working with health professionals.

Stadtteilspaziergänge - Walking for older people (Munich, Germany)

Aim

To encourage older people to walk more in their daily life and to improve their knowledge about road safety.

The Course

The needs of older people were considered by the City of Munich planners who decided to link with the AENEAS project and with the local NGO, Green City, the Munich police and the Older Peoples Service Centre. Together, they developed a city map for older people covering three districts of the city, which was made available free of charge. Green City, together with the Munich police and the Older Peoples Service Centre, offered courses for the participants in the use of the city maps. Each course took two afternoons. During the first afternoon, the Munich police advised the participants about road safety and showed them a draft version of the city map. Afterwards, a short walk was undertaken to show how the map may be used. Each participant received a copy of the map to enable them to use it for one week under real life conditions. The maps were printed to a large scale and showed points of interest to older people.

Outcome

One week later, during the second afternoon, staff from Green City and the City of Munich considered all the comments and suggestions from the participants. These directly influenced the content of the city map and helped to improve it and make it more user friendly. The city map received much favourable comment from the local press, which encouraged more people to attend the courses and use it.

5 - Multi Modal Travel & Road Safety Training for Older People

Older Road Users Workshops (Liverpool, UK)

Aim

To deliver workshops aimed at older road users and raise awareness of the risks this group faces.

The Course

Liverpool Council worked with Liverpool Primary Care Trust and Age UK.

Older Road Users Awareness Day *(St Helens, UK)*

St Helens Council's Road Safety and Travel

Awareness Team held an Older Road Users Awareness Day' at St Helens Town Hall in the autumn of 2011.

Pedestrians, drivers and passengers over the age of 55 years were invited to attend the event, which included presentations, a multi-agency market stand area and afternoon tea.

The Good Egg Older Persons Guide to Road Safety was handed out to participants, and Merseyside Police offered free driving lessons, which were delivered by the Automobile Association (AA).

Figure 64 - Older Users Awareness Day (St Helens, UK)

Older People and Road Safety *(Donostia San Sebastián, Spain)*

Aim

To investigate how older people respond to traffic situations and to improve road safety in the streets of Donostia San Sebastián.

The Course

In order to promote and to ensure safety in the streets of Donostia San Sebastián, the municipality, in collaboration with the Real Automovil Club Vasco Navarro (RACVN), organised twenty workshops. These were intended to see how older people responded to different traffic situations and how road safety may be promoted and improved. The training included a short presentation about the AENEAS project and an explanation of sustainable mobility and how it has changed over the years. After this, practical cases of different safety problems were presented to the group and discussed in order to provide appropriate solutions. These solutions, and how they can be achieved, were later presented to the group and discussed. The workshops encouraged active participation.

Outcome

It was apparent from discussions with participants, most of whom were men, that the majority continued to drive as they had done before. It was therefore apparent that a change to more sustainable modes of transport will be a challenge. However, most had a positive outlook and were aware of traffic safety and the need to respect pedestrians and cyclists. It was found that some participants were too trusting of other people's behaviour on the road and believed that cars would always stop for them. However, this assumption is not always the case, so it was necessary to explain the risks they were taking and how these could be mitigated. The main difficulty of the workshops was keeping a focus on the main tasks. Many participants digressed and described their own experiences, which were often not related to the course.

Remain Mobile, For Sure! (Germany)

Aim

To provide lessons about road safety aimed at older people.

The Course

The Deutsche Verkehrswacht (DVW) runs this project. The Road Patrol offers older people the opportunity to take part in practical exercises to see their own problems of road use from a different perspective, thus allowing them to discuss solutions.

Police Road Safety Education (Munich, Germany)

The police in Munich offer educational training about road safety combined with “coffee parties” for older people.

Smart Mobile Senior Project (Belgium)

Aim

The aims of the project included:

- To encourage older people to increase their use of sustainable modes of transport
- To change older people's negative views of sustainable transport, and encourage them to walk and cycle more
- To meet older people’s mobility needs
- Tackle social exclusion through improved mobility

The Course

This course was provided by Mobiel 21 who co-operated closely with organisations representing older people in the Flemish Region of Belgium. The topic of traffic safety proved to be very important. Until the final project year of 2009, 12 municipalities have participated. The involvement of people 55-60 years of age proved to be substantial in all actions because they lead more active lives and can pull along the other members. It is important to present easily manageable ideas to older people’s organisations.

The project is all about communication and works towards a sustainable change by applying the so-called “4 E’s” approach:

> **Enable:** Guarantee basic mobility: In Flanders all citizens have access to public transport within 500 metres of their door
>
> **Encourage:** social costs, police (incentives): In Belgium all citizens over 65 receive a free public transport pass. Even so, only 10% of bus trips are made by older people although they represent 20% of the population.

Exemplify: offer opportunities to test public transport
Engage: working within own social networks

6 - Non-transport related workshops aimed at older people

Fit as a Fiddle *(Nationwide, UK)*

Aim

A nationwide programme, supporting people aged over 50 with physical activity, healthy eating and mental well-being.

Figure 65: Fit as a Fiddle Scheme (UK)

The Programme

This is an Age UK programme that champions physical activity and well-being for older people and is funded by the National Lottery. The programme makes a huge impact and benefits the lives of older people in many ways. It is offered in Cheshire, South Lakeland, Lancashire, Mid Mersey, and Oldham. Cheshire's Fit as a Fiddle project is called ARCH (Activities in Rural Cheshire), which offers healthy eating and physical activity workshops to isolated older people in rural Cheshire, including activities such as walking and tai chi.

Outcome

Age UK Cheshire East wants to ensure that existing projects are continued, new groups are developed and the legacy created by Fit as a Fiddle can benefit generations to come.

ITea and Biscuits Week (Nationwide, UK)

Aim

To inspire and support older people to discover the many benefits of digital technology.

The Scheme

This popular annual event is run by Age UK and provides a number of free taster sessions, which involve peer-to-peer mentoring, in order to enable older people to learn about computers, the internet, digital cameras and social networking. The event held between 19th and 25th September, 2011 successfully introduced 7000 people to new technology, with 92% of them wanting to know more after attending one of the events.

iPad Sessions

Aim

To train older people to use new technology, so they may improve their communication and creative skills in an easy and accessible way.

The Course

The UK is also host to these IT-based sessions, which are available to those residing in care homes. The sessions are on-going and there is a commitment to continue this helpful resource.

Conclusions

- There has been a widespread lack of formal evaluation of training and awareness workshops leading to an almost complete absence of evidence based design.
- Many schemes that have succeeded in the short term have not been extended beyond an initial pilot.
- A lack of attention to effective recruitment has resulted in poor take up of well-designed courses and events.
- Training and education projects having high take up following an initial launch, have failed to maintain momentum in the recruitment of participants, by viewing this as a one off exercise.
- Participants with the greatest enthusiasm for attending a training course may well not be those who would benefit the most from it.
- In most cases, courses have been designed and implemented without regular review of content and effectiveness.
- Training activities for older people are delivered on a diverse range of subjects by a variety of providers, and there is potential to incorporate road safety and transport messages into existing schemes.
- Older people may not identify themselves by age group and may reject a course targeted at "older" people.
- Older people learn more when actively involved.
- Lack of confidence is a barrier to using public transport, especially in large European cities.
- Public transport training schemes involving peer-to-peer mentoring seem to be the most successful as participants can relate to someone of a similar age group more easily.
- Driver training courses can be delivered anywhere, or targeted specifically where there have been significant highway changes.
- Workshops increased older people's road safety awareness and their knowledge of how to access support and information regarding a variety of transport modes.
- Workshops are more successful where consideration has been given to local demographics, geography and infrastructure.
- Awareness and training interventions are more positively received when delivered at an appropriate time of life such as following life changing events, for example retirement or bereavement.

See Appendix on the SaMERU website for directory of EU workshops, training and courses.

Action 6.8: Training and awareness workshops

Executive Summary

This report focuses on cycle training for residents aged 65 plus in Lancashire but other reports on driver training, community road shows and a practitioner seminar are available from the County Council on request.

Cycling casualties in the 65 plus age group are relatively low in Lancashire, when compared with drivers. This is not the case in Modena, where levels of both cycling and cycling casualties are considerably higher.

Whilst actively engaged in increasing the numbers of cyclists in this age group, the further development of appropriate training aims to prevent a corresponding rise in casualties.

The focus of this research is to:

- Examine the extent to which the UK's nationally available cycle training scheme 'Bikeability' is matched to the needs of cyclists who are aged 65 years or over.
- Identify which typical features of the UK Bikeability cycle training course helped this age range and which additional training features were added to assist learning and skill development, to promote more confidence and safer cycling.
- Suggest further actions which can help the client learn to be safer and more confident in their ability to cycle.
- Recommend actions which all EU member states should prioritise to reduce the risk of collisions involving older cyclists.

Methodology

Recruit 10 participants and conduct qualitative research by offering up to six hours one to one training per participant, off-road and on-roads familiar to individuals with detailed observations and follow up.

Key Findings

- The training provided helped all participants to reduce risk by improving on making observations, balance, co-ordination and road positioning.
- The delivery and course structure of UK Bikeability are suitable for this age group in that the instructor assesses each client individually, and tailors the course accordingly.
- Older residents were more easily recruited to an "Adult" cycle training course than to a course for those aged 65+.
- Participants in this age group welcomed a written document to refer back to after course completion; however available course materials were designed for children.
- Age related movement impairment is an issue and needs specific attention on an individual basis as this varies in extent considerably between clients in the same age range.
- Participants were very aware of their physical limitations, but less aware of how these might affect their ability to make effective observations while cycling.
- The majority of clients had high levels of concern about being involved in a collision with a motor vehicle or falling off their bicycle.
- Participants were happy to use safety equipment such as helmet, gloves and high visibility clothing.
- In the case study, which involved detailed follow up, a participant cycling regularly following the cycle training reported a significant improvement in the symptoms of polymyalgia, an arthritic joint condition.

Recommendations

- Incorporate cycle training for older residents into a wider adult cycle training scheme where possible with guidance on course delivery for those aged 65 plus provided to the cycle training provider.
- When targeting cycle training at residents aged 65 plus promotional materials should seek to reassure potential participants regarding common concerns highlighted in this report.
- Those with medical conditions which could be eased by cycling should be encouraged to participate in cycle training through a healthcare practitioner referral scheme.
- Consider the development of an "Adult Bikeability" booklet to accompany adult cycle training courses including sections relevant to those with sensory or movement impairment, selecting a bicycle and accessories, medical conditions and health.
- Link cycle training schemes with regular, organised group rides in the local area to encourage future cycling, build confidence and offer social contact.
- Provide a variety of bicycles for use during the training sessions with regard to the provision of low step through frames, thumb operated gear levers and handlebar mirrors.
- Joining instructions for the cycle training course should be clearly stated with the opportunity provided to discuss any concerns in advance.
- Ease of access to the training venue, reassurance, short teaching points, beverages and toilet facilities should all be considered particularly for this age group.
- Allow additional time during the training sessions for discussion, selection and adjustment of the bicycle, and compensating for movement and hearing impairments.
- Provide guidance to cycle training providers, retailers and where appropriate cycle training participants on the selection of bicycles suitable for those with restricted movement.
- Training providers and cycling promoters should provide advice on adapted bicycle schemes to those unable to cycle confidently and safely on a conventional bicycle.

Conclusions

- **Promotion.** Despite widespread and targeted promotion specifically aimed at those aged 65 plus, the numbers of people in this age range wanting to take part in this pilot training were very low, especially when compared to the numbers of older drivers who wanted to participate in a driver training course. Although we know of high numbers of experienced cyclists who are over 65, people in this group tend to feel that they do not need further training. However, we also know that large numbers of people are choosing to cycle for leisure in their retirement. It was from this group that the cyclists taking part in the training came. In addition to SAMERU cycle training research, Lancashire County Council has also delivered Adult Cycle Training to 480 adults aged 17 years or over, during 2012. Of these, approximately 30%, 144 individuals, were aged 65 years or over. It is therefore recommended that cycle training for older residents be incorporated into a wider adult cycle training programme where possible, with the training provider given guidance on training older cyclists. If a cycle training course is to be targeted specifically at residents over 65. Promotional material needs to be designed to reassure potential participants regarding concerns raised during this pilot, and to encourage those with medical conditions which could be eased by cycling to come forward through a health practitioner referral scheme.
- **UK Bikeability**. The flexibility of this course matched the learning needs of these clients, who present a range of issues which need to be addressed differently and individually.

- **Course materials.** Attractive course learning materials (colourful cartoon based booklets) were offered to clients, but they were produced for 11 year olds. The instructor pointed this out, but the clients still welcomed a written document to refer back to after the course was completed. The messages were presented well and were clear, so with some adaptation, they would be useful. On successful completion of a training level, the instructor also gave the clients the UK Bikeability metal pin badge and a certificate. The clients wore the badges with some pride on their outer clothing and commented that they would talk about the course with their young grandchildren. The items used were designed to be aimed at children. Although the same messages apply, they need to be modified to be age appropriate
- **Client performance**. The clients were very committed to learning cycle skills. They all presented a positive attitude towards learning and were very willing to try out new manoeuvres. All made some progress to some extent as a result of this training.
- **Impairment**. There was correlation with known medical conditions that can lead to driver impairment. These conditions are physical, cognitive and visual. All of these had some effect on the clients' abilities to learn new skills and improve established skills during the UK Bikeability cycle training course. The most common physical problems that the clients presented were joint difficulties, such as arthritis. This caused problems in gripping brakes and handle bars, as well as difficulties in stepping through the bicycle frame and getting onto the saddle. When the cyclists needed to look behind, a common problem was turning the middle section and upper sections of the body. Experienced cyclists, who have cycled for decades, have maintained flexibility and seem less likely to have problems when looking behind. Further research into the use of handle bar mounted mirrors for older cyclists is recommended. Training providers should provide advice on adapted bicycle purchase and hire schemes, to those unable to cycle confidently and safely on a conventional bicycle.
- **Safety concerns and confidence.** The majority of clients had high levels of concern about being involved in a collision involving a motor vehicle and also falling off the bicycle. This affected their choice of route when cycling and many preferred to cycle as part of a group on organised and led rides. One client used cycle lanes at the side of the road and then cycled on the pavement to complete the journey to her home address. The encouragement and social contact from taking part in regular, organised group rides helped the clients to cycle more frequently and become more confident.
- **Using safety equipment.** On initial Bikeability Level 1 training, clients were happy to use safety equipment such as helmets and gloves. Many clients also arrived wearing bright or high visibility clothing. They were aware of the difference between fluorescent materials for daylight use and reflective material for use in darkness. Clients preferred to use sports type clothing, such as track suits and training shoes. The participants were very aware of their own physical limitations, such as hand or grip conditions and getting onto the bicycle to begin cycling. They were less aware of the impairment in their movement and how this affected their ability to make effective observations, whilst cycling. In particular, observations behind the cyclists were difficult. Although they are not a substitute for actual observation, mirrors attached to the handlebar have been of some help for the clients.
- **Importance of facilities and pre course preparation**. Clear information about where the training will take place and how to get there is, of course, important to all ages. With over 65's, it was found that it was helpful to reinforce written information with a telephone call. Verbal confirmation was important to the clients, as was the reassurance and the opportunity to address concerns offered during a telephone conversation. Clients often asked about toilet facilities and refreshments were requested and asked for during these telephone conversations.

- **Choice of bicycle.** It was helpful that there were a few different types of frame for clients to try out and use, before they began their training session. Gear levers that could be operated easily by using the thumb, whilst keeping hold of the handlebar were preferred by the clients in this age range. A low cross bar and larger wheels were also preferred. It is recommended that guidance on purchasing a bicycle suitable for older cyclists with movement restriction should be issued to cycle training providers and retailers.
- **Road user compensatory strategies**. It is believed that older people use the roads in ways that they feel reduce their risk of collision and also compensate for their declining abilities, (Tay 2008). These measures, for car drivers, include avoiding driving in darkness or poor weather conditions, always wearing a seat belt, using spectacles, not driving after consuming alcohol, only driving on quieter roads and familiar routes, reducing speeds and journey length. Similar strategies were favoured by the older cyclist taking part in this research. Clients taking part in this cycle training were more confident about making left turns than they were about making right turns and so modified their routes to reduce right turns. They had difficulties in making appropriate observations due to balance and co-ordination and experienced difficulties in selecting the appropriate road position. The training they received helped all the clients to make some progress on these issues. They were happy to wear cycle helmets, gloves and other safety equipment such as high visibility clothing.

What is UK Bikeability?

In 2007, a group of leading cycle training groups and road safety practitioners, who were members of the Cycle Training Standards Board (CTSB), produced a programme for the delivery of uniform, consistent training outcomes which formed 'The National Cycle Training Standard'. These training outcomes are used in the training course marketed as Bikeability. Although designed for all age ranges and ability levels, most common uptake is among school-children and so course material is aimed at that age range. The UK Department for Transport has provided funding for large numbers of children to be trained in their last year at primary school. There is funding available nationally for Bikeability in schools. Many instructors will also be used to dealing with the specific needs of children, although some instructors may need help in adapting their approach for older users.

There are 4 main principles of this course:

1. **Cycle training should be delivered in realistic conditions.**
2. **Clients should be trained to recognise and respond** to the features of the road conditions of each traffic context they are in, so that they learn to control the bicycle, signal to other road users safely, make appropriate observations, select correct road positions and implement safe decision making.
3. **Training should be developmental and progressive.** As the client's skill level increases, the road environment selected for training should become increasingly and correspondingly challenging, so that skill development can occur. Instructors should continually assess the client's performance and provide experiences that are matched to their needs and will help the client to progress and develop.
4. **Clients should be encouraged to be safe and autonomous cyclists.** This means not teaching rigid rules or 'drills', but equipping the cyclist with a range of safe responses to situations and helping them make appropriate observations, decisions or manoeuvres.

Three Bikeability course levels:

Level 1: Basic cycle control, off road. Observations, signalling and cycle safety checks

Level 2: Quiet roads including 'T' junctions, left and right turns, passing parked vehicles and side roads

Level 3: Busier, more challenging roads, complex junctions e.g. right turns at traffic lights, roundabouts

UK Bikeability Course Content Summaries

Level 1. Delivered on a Playground or Other Suitable Off Road Area.

Bicycle check. Trainees are taught to check their own bikes but each bike is also signed off by the instructor.

Figure 66: UK Bikeability Course

Equipment check. Those wearing helmets are taught how to adjust them and there is a discussion of safety equipment and what to wear.

Cycle control. Getting on and off and starting and stopping in a circle. Cycle in a straight line turn and return: Further steering and control exercises can be incorporated, if needed.

Emergency stop exercise. The collision avoidance/swerve exercise is added in when the group or client is stopping effectively. Cycle in a straight line and look behind: the instructor holds up a number of fingers and the trainee tells the instructor how many they saw. Cycling in a straight line and signal direction of turn (left or right). Cycling in a circle to practise using different gears. Further control exercises if time permits, figure of 8 or slow cycle race.

Level 2. Start and Finish an On-road Journey
Understanding where to ride on-roads using the correct road position. Be aware of everything around them, including behind as they ride. A bicycle safety check is taken at the start of the session. All clients are assessed in an 'off-road' setting to ensure they can demonstrate the skills outlined in Level 1. This assessment is done before moving on to the on-road training described in Level 2. The training area used is risk assessed prior to and during training.

Make a 'U'-turn (Not essential).

Pass parked or slower moving vehicles.

Passing side roads.

Turn left into a minor and major road, understanding how and when to signal intentions to other road users.

Turn right into a minor and major road, understanding how and when to signal intentions to other road users. If the local road environment allows, these manoeuvres should also be carried out at a cross roads and a mini roundabout. Practising riding in pairs and in a group on the road is optional.

Level 3 Route Planning

For this Level, route planning is based on the roads that the client will need to use on a regular basis. Where there are more challenging features such as busier roads, roundabouts and multi lane traffic light controlled junctions, the client is taught move safely and positively through these features. It is accepted that clients will use different routes and road features, but the training should aim to ensure that each client can demonstrate they have the skills to use road environments and traffic contexts of a busier and more advanced level. The instructor assesses what ability level the client has, from practical observations and then encourages the client to use and apply their skills in increasingly challenging contexts.

Most level 3 courses are trained one to one, although in some circumstances two or, very rarely, three trainees may be trained by one instructor. Where more trainees are involved it is likely that more than one 2 hour session will be required.

Encourage and develop safe cycling skills. Building on from the previous levels.

Develop positive attitudes towards road use. Knowing and using correct road positioning correctly. (i.e. Primary and Secondary)

Increase knowledge and understanding of the road and traffic environment. Enabling the client to make safe traffic decisions.

Promote confidence to use their cycles on longer journeys. Having gained the skills to use more challenging road features and demonstrated this ability, the clients should feel able to make trips over longer distances on the bicycle. These longer trips are more likely to include a variety of more challenging road features.

Case Study

Introduction

June is 72 years old and lives alone in the Fulwood area of Preston. Fulwood is a suburban residential area some 5 kilometres away from Preston City Centre. It has a relatively low crime rate and has a number of parks and open, green spaces. Fulwood also has a frequent bus service to Preston City Centre, local shops and health care provision, including a major teaching hospital. June chose to relocate from her previous home in Manchester, to live closer to her brother. June chose to live in a bungalow (a ground floor house) as she suffers from polymyalgia, which is a long term arthritic joint condition.

Modes of Travel Used

June previously owned a car and was a regular car driver until shortly before her 70th birthday, when her polymyalgia condition deteriorated. June suffered from severe joint pain and was unable to get in and out of the car. When June was due to renew her driving licence on her 70th birthday, she was unsure whether she would be well enough to drive again and so allowed her licence to lapse. She was aware that she would have to sit a retest and reapply for her licence, but eventually felt that this would too difficult to cope with, so she allowed the licence to expire and sold her car. Since then, June has walked, or used her concessionary bus pass, but, after taking part in the UK Bikeability cycle training, she also uses her new bicycle for short, local trips.

Health Conditions

Polymyalgia rheumatica is a condition that causes pain and stiffness in the muscles around the shoulders, neck, buttocks and hips, because of inflammation. It is similar to a condition to a condition called fibromyalgia, which causes debilitating pain all over the body and especially in the joints. Fibromyalgia is a more widespread condition that affects 1 in 20 older people. It also causes disturbed pain messages, low levels of 'mood' hormones and sleep problems. It can affect movement, balance and grip, as well as tiredness and fatigue. (NHS Choices website. Nov 2012) Gentle, regular exercise is recommended to help people with polymyalgia. June has been advised by her doctor that she should walk or cycle for 30 minutes, every day. She has found that her symptoms improve when she has exercised regularly.

Wakening in the morning is a particular problem for arthritis sufferers. It takes June around one hour for the joint pain to subside to a level where she can tolerate walking, cycling or making journeys by any mode. This is important to bear in mind when arranging training courses as an early start time for clients with arthritic conditions is likely to be very unhelpful. Similarly, clients may want to avoid making journeys until later in the day. Typically, this is preferred as they can also avoid peak flow or 'rush hour' traffic. Towards the end of the day, joint fatigue and pain returns and causes movement problems for suffers of this condition. June compensates for this by reducing her cycle trip length and returning home before the evening peak rush hour. She feels unsafe about cycling on busy roads or in heavy traffic and so avoids travelling in these conditions.

June's polymyalgia affects her hip joints, her hand grip and her neck/shoulder area. Whilst cycling, June has difficulty in getting onto the bicycle, but selecting a bicycle with a low cross bar was helpful. Gloves and easy to reach brake and gear levers were found to help with June's hand grip problems. The neck and shoulder problems meant that she found turning round to make observations behind difficult. This was helped by carrying out some 'warm up' stretches, for the neck, at the start of each cycle ride and the condition was helped to a greater extent by attaching a handlebar mirror to June's bicycle. The first handlebar mirror June used was unhelpful because it had a convex lens and distorted the views behind. It made objects look closer and smaller than they actually were. A change to a flatter lens mirror corrected the distortion and was then very useful to June.

June had worked as a high school teacher, until she retired. She had been very active and enjoyed canoeing as a hobby. Unfortunately, her polymyalgia condition meant that she had difficulty placing the canoe on top of her car as well as driving the vehicle.

When June relocated to Preston, she began to take part in social, organised led rides but had to use a bicycle loaned to her from the scheme organisers. June was able to attend the social rides as they were close to her home. The park where the rides were held had off road cycle paths, access to toilets and refreshment facilities. The organiser was very enthusiastic and encouraging to the participants, even organising other non cycling social events. June established a circle of friends through her cycling and it soon became a regular part of June's week. June thoroughly enjoyed taking part in these off road rides, but didn't feel confident cycling on road. At this point, June decided to attend the SaMERU cycle training course. She found the course increased her confidence levels and specifically about helped her to choose a bicycle for herself, which had features that addressed her needs and also the course identified where June's cycling skills could be developed.

June bought a bicycle for her use and travels to and from the off road led rides independently. She has now taken part in longer organised rides, including most of the 21 mile long orbital route ride around Preston City Centre. She takes part in the 'Breeze' bicycle rides organised by British Cycling. June also has bought some panniers for her bicycle and uses them to carry small items of shopping home.

Taking part in SaMERU cycle training, based on UK Bikeability, has enabled June, shown in Figure 67, to take the steps she needed to cycle more often and more confidently, as well as reducing her polymyalgia symptoms. Her posture has improved and her back is more upright.

Figure 67 - UK Bikeability

Background

Challenges and barriers

'Ageing can bring positive attributes, to road users, such as greater social responsibility and better strategic thinking - but it can also bring impairment and decline, which can have adverse consequences for collision risk in the over 65 age range.' (O Neill, D. 2001, 2005). Although they vary in the age of onset and severity from one person to another, impairments which affect road user safety can be grouped into three main types:

Physical: Restricted joint movements, such as the head and neck, which can cause difficulty in scanning the road environment.

Cognitive: Difficulties in processing information, which can lead to an older person needing to take longer to gather the information required to make a decision.

Visual: Age related sight problems, such as cataracts and tunnel vision.

In this research, we have specifically explored how these impairment issues may have affected the clients and more significantly, explore possible compensatory measures to minimise the effect of these issues to collision risk, through using the UK Bikeability training model.

Collision Causation

Although there is little research on collision causation among older cyclists, there has been extensive research into the areas of specific errors and violations among older drivers, much of which will also apply to cyclists. A summary (Clarke et al 2009) produced by the UK Department for Transport about the causes of collisions is:

1) **Focus and distraction.** The task of negotiating an intersection safely and successfully requires the driver to focus their attention on and make decisions about several different and changing features, simultaneously. Some features will be irrelevant to the decision making and Hakamies et al (2004) found that older drivers have more difficulty in filtering out irrelevant stimuli in these situations.

2) **Gaze patterns and scanning the road.** When scanning the road for information, it has been found that older drivers are more likely to focus on one small section of the view in front of them. Bao and Boyle (2009) found that, compared to younger age range drivers, older drivers had a significantly smaller proportion of visual sampling to the left and right during left and right turn intersection negotiation. Bao and Boyle also found older drivers made significantly fewer glances towards the turning direction and so they were less likely to see objects in front of them as they turn at intersections.

3) **Narrow field of view and poor contrast sensitivity**. Horswill et al. (2008) used video footage to measure hazard perception times in drivers over 65 years and found that hazard perception response times increase with age and the reduction in contrast sensitivity contributes to a reduction in the useful field of view. These two factors make the detection of traffic conflicts more difficult and process the information into safe decisions and manoeuvres.

4) **Judging the speed of approaching vehicles.** Hancock and Manser (1997) found that older drivers may be poor at judging the approach speed of a 'target' vehicle. Spek et al. (2006) found that older drivers, when crossing a stream of moving traffic tended to accept smaller time gaps as the traffic approach speed increases. This suggests that the older driver is more prone to collide with speeding vehicles. Lobjois and Cavallo (2009) also found that older people, whilst travelling as pedestrians, also experience these difficulties in judging the speed of moving traffic.

5) **Slow post-turn decision manoeuvring.** In a simulated driving task, Hakamies- Blomqvist et al (2004), found that older drivers completing turn manoeuvres tended to take more time to accelerate and complete their manoeuvre, compared to other age range drivers. Similarly, Yan et al (2007) found that older drivers tended to select larger gaps to make turns, turning the steering wheel more slowly and keeping a further clearance distance from the vehicle ahead after the turn.

For older drivers, collision causation centres upon insufficient and ineffective use of observation. Illness and fatigue also contribute to collision causation. UK Bikeability can help train clients to make more effective observations as road users and can help them learn how to construct safe responses. By cycling more often clients can maintain or improve fitness levels and this in turn can help to reduce fatigue and illness.

Survey and Training Results

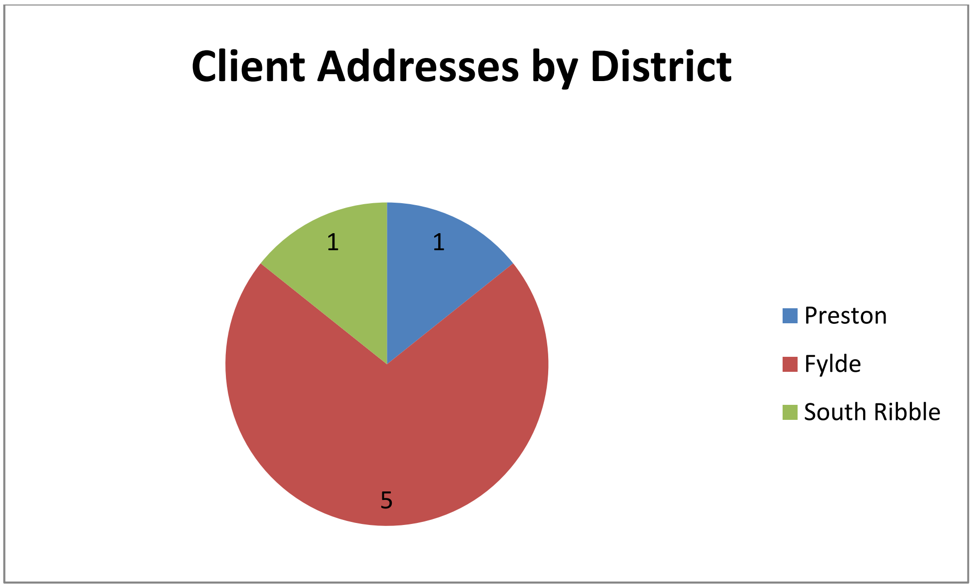
Training Course Promotion

A5 promotional leaflets were distributed to local leisure centres, swimming pools, libraries, town hall information desks, a YMCA gymnasium, cycle shops, medical centres, help and advice centres and older people charities (Age UK). These venues were chosen as they are well frequented by older people. Leisure Centres, gymnasiums and other places where people in this age range go to take part in exercise proved to be the most successful places to encourage participation in this training course. During unstructured interviews with members of leisure cycling clubs, views were expressed that these people would not want to take safety based training as they were already 'safe and experienced' enough.

Although only seven follow up survey responses were received, there were ten participants in the training. The clients completed a pre-course questionnaire, at the start of their first training session. As a result, some of the data may appear to have different response rates.

Client Responses Summer 2012 Survey

Figure 68 - Q1. Address

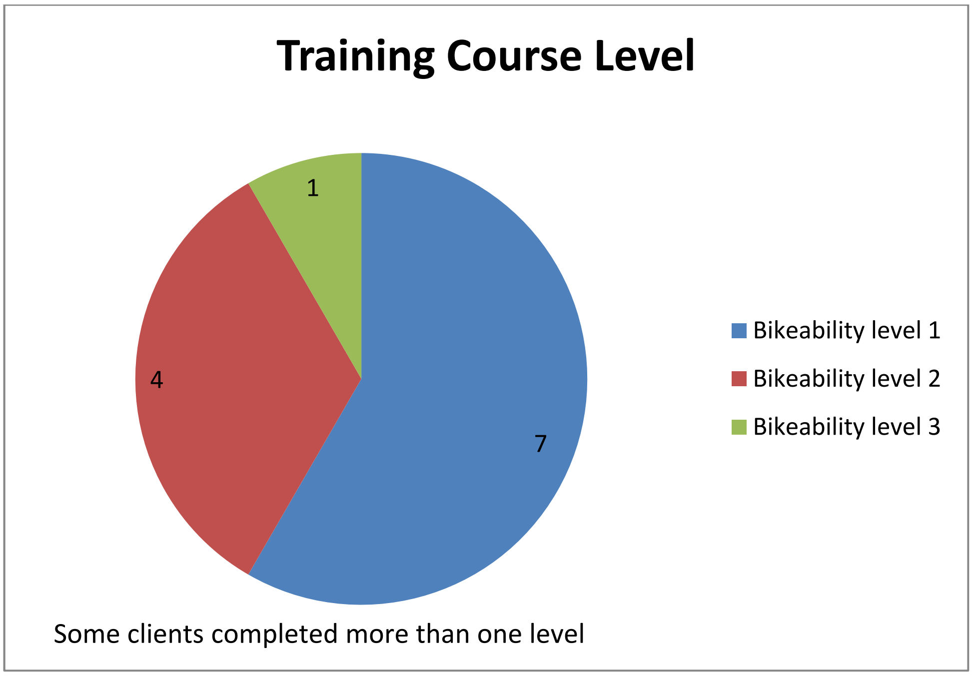


The coastal areas of Lancashire: Wyre, Fylde and Preston were particularly targeted with promotional material because there are higher population levels of older residents in these areas, compared to the other districts in Lancashire. Also, casualty data held by Lancashire County Council indicated that there are more road collisions in these areas for this age range.

Lancashire's Fylde coast is a very popular place to retire and so it was anticipated that this would be the area where the majority of clients lived. The results confirmed this. The Fylde coast is also a comparatively flat area for cycling and so the area is popular with both older and younger cyclists. Preston is mostly urban and South Ribble is mostly a suburban area. These two areas are adjacent to each other. They are separated by the River Ribble. Preston and South Ribble are well served by a new dedicated orbital walking and cycling route, known as the 'The Guild Wheel'. This route uses mostly off road dedicated paths, which are shared by pedestrians and cyclists. Road crossing points on the route have been purposely designed to assist cyclists. There are organised leisure rides in all three areas and these are popular with retired groups.

As a popular tourist destination, the Fylde coast has good infrastructure for motor vehicles, public transport and has some good cycling routes. Blackpool's world famous coast has a tram network and has a cycle hire scheme with 'cycle docking stations' at various points along the coast as well as some inland points.

Figure 69 - Q2. Course Training Level



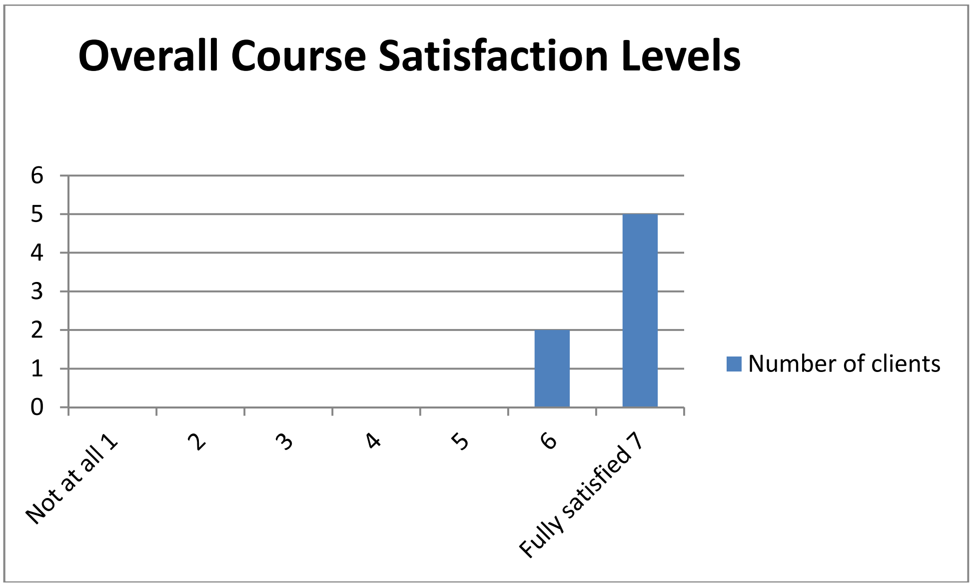
The lower levels of cycle training were the most popular, with only one person being trained to Level 3 standard.

The flexibility of the three training levels worked well with this client group. Predominantly the clients were beginner cyclists or those who had very little previous cycling experience. The areas where the clients live are well served by local road cycling groups, which welcome new and experienced cyclists. In Preston, for example, cyclists who are in this age range, meet as a club two or three times per week and then cycle in groups of about 6 to 8. Some of these are aged 80 plus and have cycled for many decades. They are well equipped, have a high level of skill and are therefore unlikely to feel the need for training courses. Cycling clubs and leisure ride organisers could serve as a useful channel to convey safety based information to regular and experienced cyclists, where this is appropriate.

The UK Bikeability course requires clients to assess their ability level in relation to the defined outcomes and was helpful with this age range. Also, the course structure uses continual assessment to determine which learning activities are most suitable to help the client make progress. There was some considerable variation in the skill level of the clients, but the three levels on the UK Bikeability course offered the flexibility to accommodate the needs of different clients in this age range and also allowed them to make progress towards achieving clearly defined learning outcomes.

The instructor delivering this training is experienced in training young children and all age ranges of adults. He is aware of when to reinforce certain teaching points and adjust the training schedule to match the learning needs that each client presents. This approach is a requirement of UK Bikeability and so would be applicable to other courses.

Figure 70 - Q3: Overall Course Satisfaction Levels



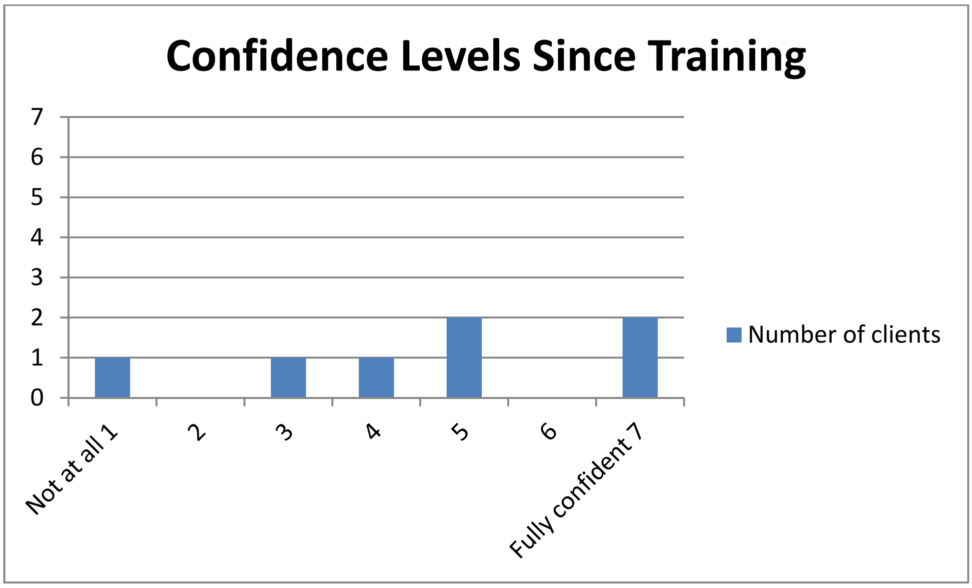
During the observed training sessions, it was evident that the clients could easily relate to the information given by the instructor. He is very experienced at delivering all 3 Levels of Bikeability, across all age ranges. Some clients chose to write in extra comments including 'excellent', 'very patient', 'clear instructions' and 'a very positive experience'.

Prior to the training taking place, the instructor issues a training course consent form, which also identifies any relevant training requirements which the client may have. This form alerts the instructor to medical conditions and sensory impairments in advance, so that the training can be modified to suit the individual client's needs. This is recommended good practice for all UK Bikeability instructors. The instructor also contacted all the clients the day before their training to make sure that the client was fully prepared for the training and had the opportunity to talk about any concerns and answer any questions that they may have. The clients in this group were concerned about issues such as clothing choices, beverages/refreshments and if there would be toilet facilities. Some clients had concerns about the bicycles they would be expected to ride and the activities they would be expected to take part in during the course. The instructor was able to explain how the UK Bikeability course is flexible to accommodate each client's needs and that the course would help the client make progress without being 'over stretched'. There was a choice of bicycles at the centre where the training took place. These bicycles are safety checked and maintained by the local authority. The UK Bikeability course allows the instructor to make some slight adjustments to the bicycle, such as raising or lowering the saddle and handle bar height, to fit the bicycle to the client correctly. Where it is possible to bring the client's own bicycle to the centre, this bicycle is safety checked and then used for the training.

Before the cycle training course starts, the instructor routinely checks that the client is aware of how to get to the training location and checks they are clear about the arrangements. They are given the opportunity to ask any questions they may have and address any concerns. One client was concerned that, as she has hearing difficulties, she would need to have the information repeated several times. Reassurances were of course given that the instructor was happy to repeat information as often as was needed. The instructor felt that this type of assistance was needed more with this age range than with other age ranges. This reassurance enabled the instructor to help the client to feel more confident, from the start of the training. Not all UK Bikeability courses offer preparation work to this extent, nor do they necessarily offer a choice of loan bicycle to the client.

After introductions were made at the start of training, the instructor showed the client the training area and where toilets and refreshment facilities could be found. He emphasised that it is fine to ask for a break for any reason and to ask questions as needed. The first stage of the training was choosing a bicycle, if the client hadn't already brought one. There was a bicycle container with loan bicycles inside and the instructor helped the client to choose which style of bicycle would suit them best to use for the training. He discussed any needs, preferences and difficulties they may have and matched this to the bicycle. Where the client has been unsure of which style of a bicycle to buy in the future, this feature of the training has proved to be helpful.

Figure 71 - Q4: Confidence Level Since Training



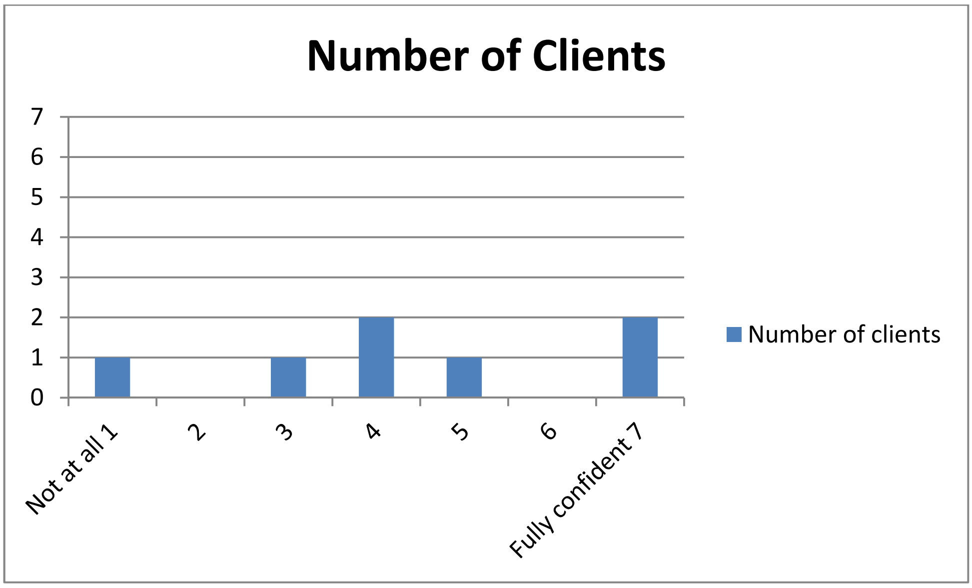
The follow up or post training evaluations indicated that most clients had significantly increased in their confidence levels. The only client who felt that her confidence had not increased since her training wrote on the end of the questionnaire:

"The fact that I do not have the confidence to do more cycling is not the fault of the trainer, he was excellent, but I did not cycle as a child and therefore came to it as a much older person and I find the mechanics of riding difficult."

This client had difficulties in maintaining the balance needed to propel the bicycle forward and stay in an upright position. She had to keep putting her foot on the ground to avoid falling. During the two hour training session this client's ability to cycle increased to the point where she was able to manoeuvre the bicycle through marker cones on the ground, spaced out at intervals. She was, however, unable to look behind whilst cycling and trying to do so made her feel unstable and she had to correct her balance by placing one foot on the ground when she attempted to look behind. The instructor was able to work on balance and cycle control with this client. There was no pressure to go onto the road element of the UK Bikeability course. (Level 2) This is because the client is continually assessed and is required to demonstrate defined competences before moving on to more challenging learning contexts. This particular client does have a car, but also travels by bus and walks, during a typical week. She is fit and active, but doesn't feel that cycling is for her. She tried to learn to cycle as family members often go on leisure rides whilst on holiday, so not being able to cycle is less of a barrier than it may otherwise have been.

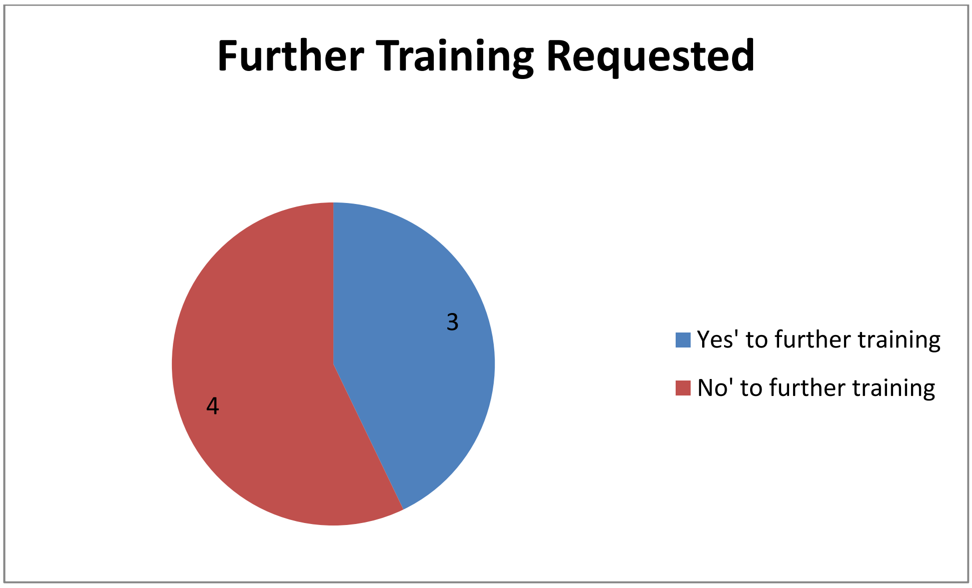
In contrast, another client gained so much from her training that afterwards she decided to buy her own bicycle. She had some limited experience of cycling as a part of an organised cycling project that aims to get more people cycling and organises short led rides off road. This project loans bicycles during the cycling session but doesn't allow them to take the bicycle home. The client did not have the use of a car and used buses or walked, but wanted to learn to travel by bicycle on the road to and from her home and to the place where the social, organised rides started. Taking the UK Bikeability course gave this client the experience and the confidence she needed to achieve this.

Figure 72 - Q5: Feeling Safe Since Training



The clients taking part in the Level 2 and 3, on road training felt safer after completing the training. The one client who didn't feel safer hadn't learnt to cycle as a child and felt that attempting to learn to cycle at her age was proving too difficult for her. During the early stages of Level I training the instructor focused on bicycle safety checks, balance and observations. Particularly, working towards the skill of being able to look behind, then in front whilst cycling was an important part of the training. The instructor commented that all the clients in this age range had difficulty, to some extent, in turning round to look behind. For this reason, we have purchased a handle bar mirror. The instructor strongly feels that turning looking behind gives the best view of the road behind, but where the client is unable to look behind fully, a mirror may be helpful. With this in mind, we offered clients who had requested further training on their evaluation forms the opportunity for further training. The clients who had completed Level 2 and 3 training commented that the training gave them a transferable plan to negotiate junctions more safely.

Figure 73 - Q6: Refresher or Further Training



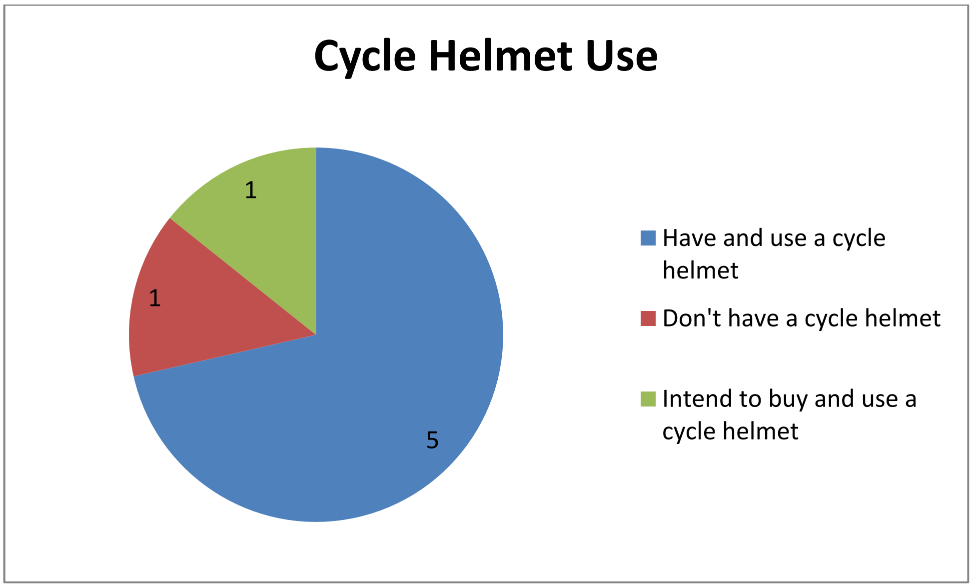
Q10: Do you own a bicycle?

All except one of the clients owned a bicycle before they took part in a cycle training course and of all these, except one person, brought their bicycle with them. These were all 'hybrid' bicycles with large wheels and straight handlebars. There was a preference for lower cross bars or top tubes as this helped getting on and off the bicycle. These bicycles also all had a good range of low gears, which the clients had chosen to minimise the exertion when cycling up hills. The instructor commented that some of the clients in this age range have problems with 'grip shift' gear controls. They find it difficult to keep hold of the handlebar for steering and at the same time move the grip section to change gear.

Q11 Did you buy a bicycle as a result of your cycle training?

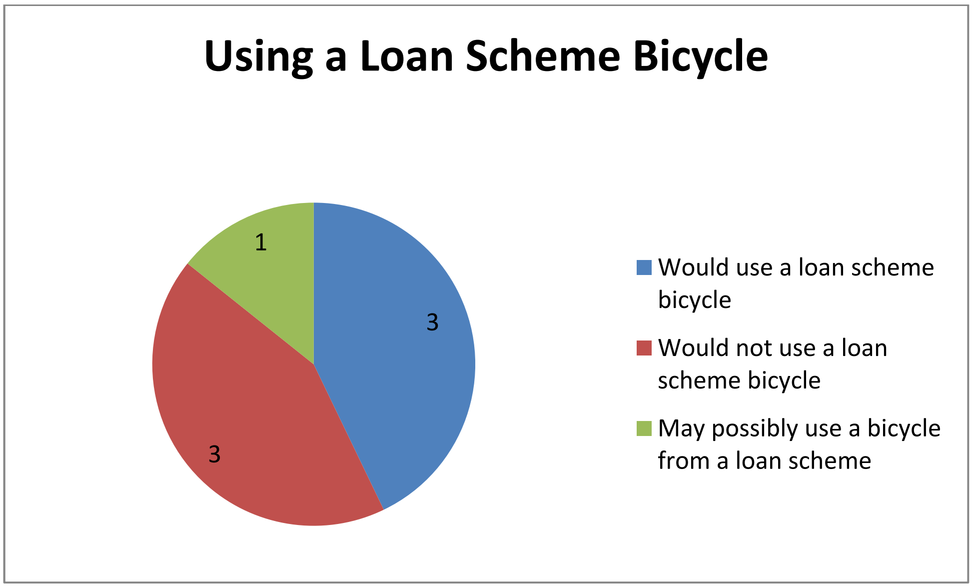
Only one of the clients bought a bicycle as a result of their training. The areas where the clients live are well served by local, independent bicycle shops and larger chain retailers. These all sell cycling clothing and equipment and offer fitting advice to their customers.

Figure 74 - Q12 Do You Have and Use a Cycle Helmet?



Although the clients were willing in principle to wear cycle helmets, not all of them had one in time for their training course. They did, however, use a helmet loaned by the training provider. Though not compulsory on the UK Bikeability course, the organisation providing the training did require a helmet to be worn. With help and fitting advice from the instructor, none of the clients objected to wearing a helmet and were happy to wear a loaned helmet for the duration of the training.

Figure 75 - Q13: If There Was One Available, Would You Use a Bicycle From a Loan Scheme?

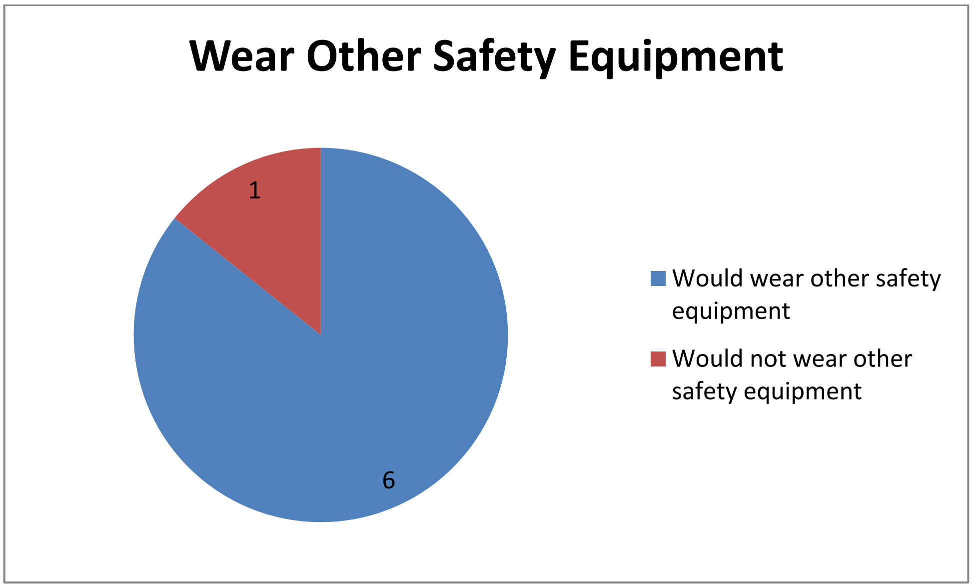


The Fylde coast has a cycle loan scheme that operates on a much smaller scale than the 'Boris Bikes' in London. Bicycles can be taken from and put back into stands along the Fylde coastal promenade. Most of the clients owned a bicycle by the time they completed their follow up questionnaire. The fact that these clients had bought their own bicycles would imply that they would have less need to hire a loan bicycle.

Q14: Would you consider a handle bar mounted rear view mirror, to help with observations?

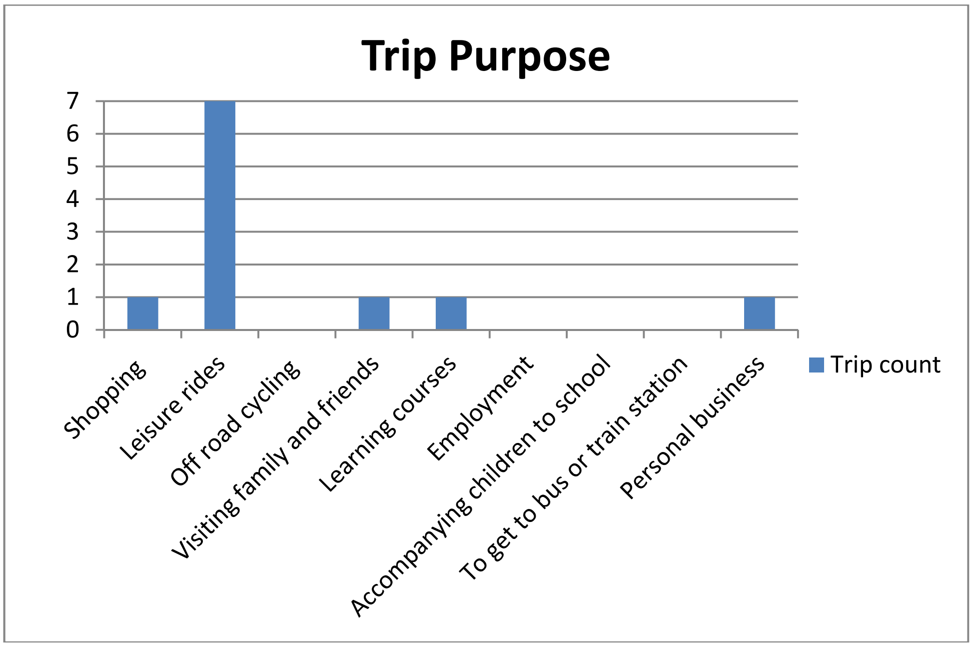
All clients would be willing to try out the use of a rear view mirror. The instructor noted that all the clients in this age range had some level of difficulty in turning around to look for traffic approaching from behind, e.g. before making a manoeuvre. Given the frequency of joint problems and difficulty with movement of the upper body to turn, bar mirrors have the potential to improve rearward observations. Further research into this is needed. In our case study, a bar mirror was very helpful.

Figure 76 - Q15: Would You Use Other Safety Equipment Such As High Visibility Clothing?



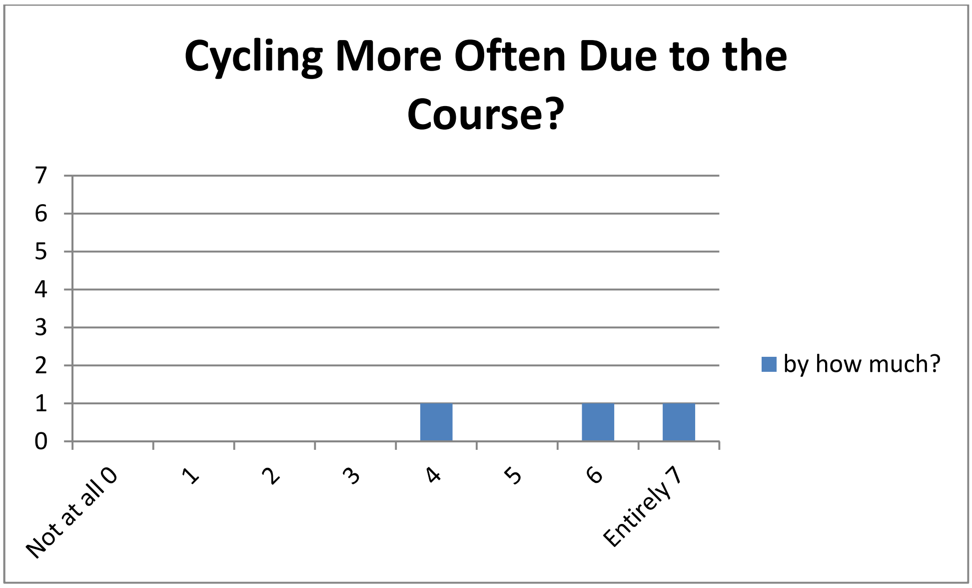
It was anticipated that older cyclists would be reluctant to wear conspicuous or high visibility clothing. However, both on the training and on the follow up survey the clients were happy to wear safety equipment. The one client who didn't want to use safety equipment was unsure about whether to continue cycling at all. During an observation, one client had arrived for training without cycle specific gloves and so borrowed a pair of cycling gloves, with pads on the flat part on the palm of the hand and had flexible fingers which helped to grip the handlebars, brake and gear levers. This client also had an arthritic hand condition and found the gloves helped with this. As the bicycles the clients used only had 'flat' pedals, they wore training shoes and did not use cycle specific shoes with 'cleats', 'toe clips' or 'clip in' devices.

Figure 77 - Q16: Which Type of Trip Would You Like To Use Your Bicycle For?



As the clients in this survey were retired, it was not surprising that there was a strong preference for cycling as a leisure activity. The instructor did attend the training on his own bicycle which had small panniers attached. He described the panniers and how they can be used to safely transport small items of shopping, whilst cycling. The clients also commented that they preferred to do a weekly shop at a supermarket and so because of the weight and volume of items purchased, they felt they would need to take a car. All the clients were physically active and liked to walk frequently.

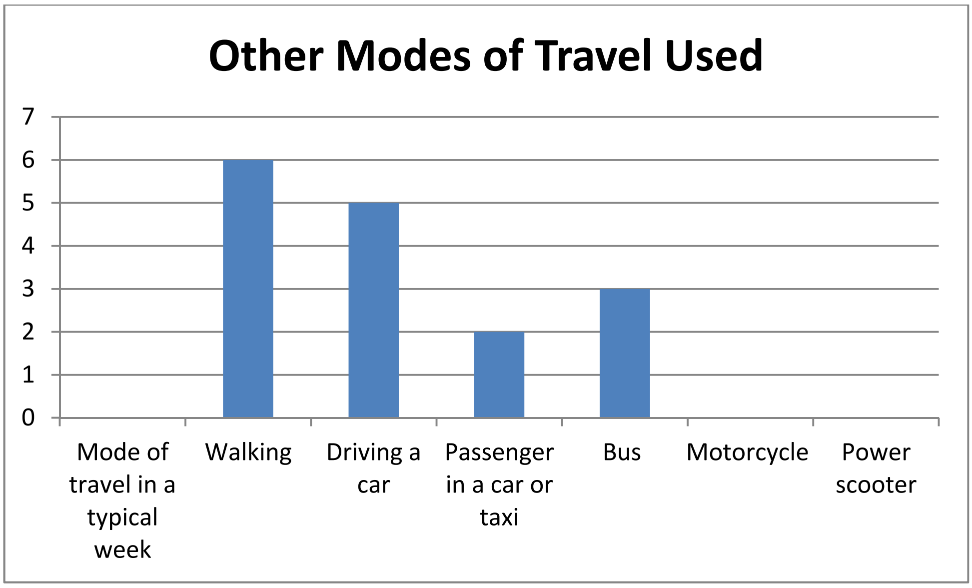
Figure 78 - Q19: If You are Cycling More Often, to What Extent Was This Due To Your Cycle Training Course?



Taking part in the UK Bikeability course has brought positive benefits through increased frequency which these clients have chosen to cycle. Some of the clients reported that they would have liked to do more cycling but the onset of illness had prevented them. One client has had a heart problem (whilst gardening) since she took part in the UK Bikeability training course. Another survey on the effectiveness of cycle training by Cycle Training UK (CTUK) published in March

2004, found that the number of bicycle trips people made after training increased by 144%, (from 0.9 to 2.2 trips per week). However this survey issued 2000 questionnaires and had a 30% response rate (664 returned questionnaires). This survey included all age ranges.

Figure 79 - Q20: What Other Ways Do You Travel in a Typical Week?



As active individuals, the clients who took part in this training had access to other modes of transport. They all lived in urban or suburban areas and where there was some public transport available. All the clients all had free bus passes and made regular use of them.

Figure 80 - Q21: Please Tell Us Your Age

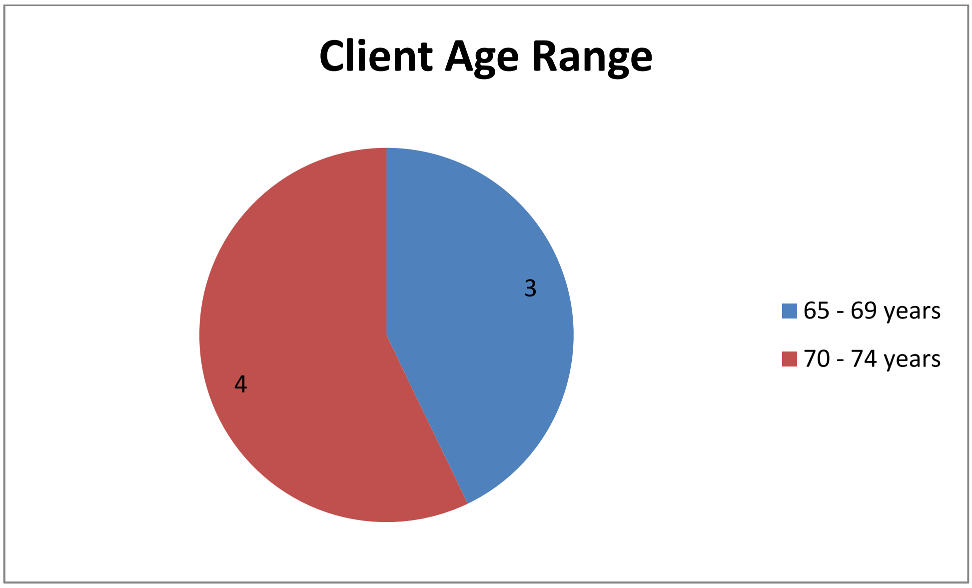
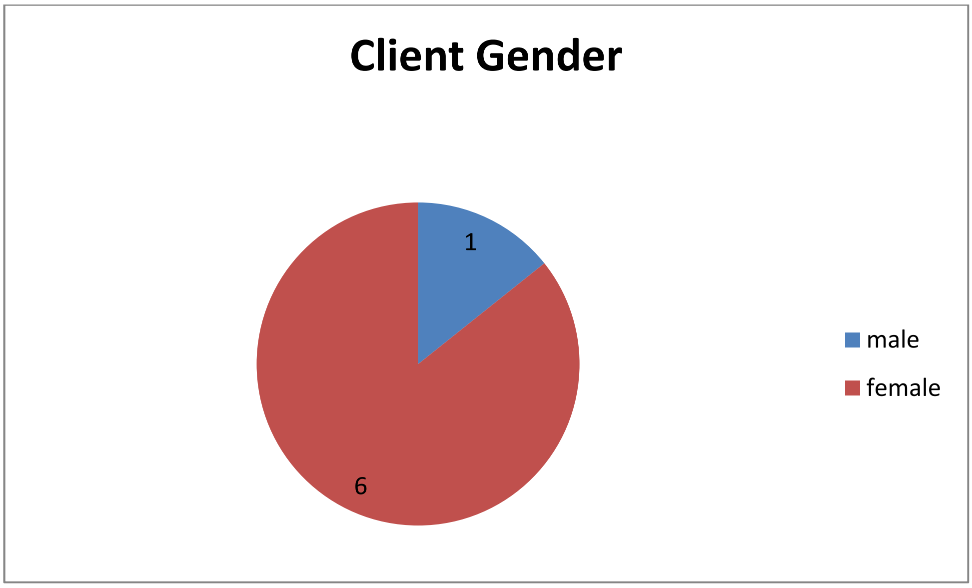


Figure 81 - Q22: Please Tell Us Your Gender



It is clear that the majority of clients taking part in this training were women. In an unstructured interview with instructors in the York area, there was a comment that promotional leaflets should be a different design to encourage men and women to cycle. Men expressed a wish to get to their destination in the shortest possible time, whereas the women focused on arriving safely. The survey carried out by CTUK (published in March 2004) indicated that trainees up to the age of 16 years were predominantly male, however there was shift in the older age ranges so that in the 55 - 64 years age range 95% of the respondents were female.

Q23: Please describe your ethnicity

All clients taking part in this UK Bikeability training were white British. This was not unexpected as this compares with the demographic composition of the districts where the clients came from for training. In other areas, where there are let, organised, social rides off-road, there are clients with a wider range of ethnic origins.

Q24: Please describe any disabilities, which affect your mobility

The clients did present joint problems and problems with balance and co ordination but chose not to mention them on the questionnaire. Only one client described having rheumatism, arthritis and polymyalgia. This presented specific problems during training. She described that she needed at least an hour after waking up in the morning for her joints to be become free enough to move around easily. The implication for training courses is that it is best to avoid starting training courses too early in the morning. The client also needed easy access to ground floor toilets, as she had difficulties in using stairs. The client's doctor had recommended she walks or cycles for at least 30 minutes every day to help with her joint condition. She feels that regular cycling does improve the condition. At the start of the training, this client asked again if it was acceptable to pause the training frequently for breaks. She had brought a flask so that she could rest and have a hot drink occasionally. She also checked that the instructor would speak slowly and clearly, using short sentences, because of her hearing difficulties. The instructor was aware of this and fully accommodated these requests. He also commented that clients in this age range need time to discuss 'what is on their mind' and make remarks before they follow out instructions, more than other age ranges do.

When choosing a cycle for this client to use the instructor took great care to select a bicycle that suited the client's needs. The arthritic condition in the client's hands meant that she had problems holding the handlebars and gripping the brake levers, as well as controlling the gear levers. This was reduced by the client wearing cycling gloves which have carefully positioned pads to allow comfortable grip. Also, the bicycle chosen had straight handlebars and thumb operated gear levers, which the client felt helped.

Once the client had chosen a bicycle and helmet, if needed, the instructor taught the client to carry out a basic cycle safety check. Part of this safety check is to make sure that the tyres are correctly inflated. One client had problems squeezing the tyre to check for pressure. Even pressing the tyre was difficult for the clients with arthritic conditions in their hands. For these people it may be advisable to have a 'track pump' as it has gauge or display to show how much pressure is in the tyre. Gripping a small, conventional pump to inflate the tyre may prove difficult and so again, a track pump may be helpful.

Another problem these arthritic health conditions presented was difficulty in stepping through the frame of the bicycle when starting off. The client experienced difficulty in lifting her leg from the ground and over the top tube or cross bar to begin cycling. This client found that holding the handlebar and lowering the bicycle so that the cross bar was closer to the ground was helpful in getting onto the bicycle. She also had problems in beginning cycling from a kerb. The instructor helped with these movement restrictions by selecting a bicycle with a lower cross bar and by offering a choice of a sitting position or a standing position when starting the training manoeuvres. Both these adaptations minimised the problems for this client.

During the training manoeuvres at the start of the training, the client had to place her foot on the floor, but this reduced as the training progressed and her confidence grew. She had specifically chosen footwear which gave her ankle support for when she was stationary and had rigid soles to help her apply appropriate pressure on the pedals.

Q25: Do you have any eye sight problems?

In the UK there is good provision for eyesight checks. Opticians are trained to detect a wide range of problems such as cataracts and glaucoma. All the clients taking part in this cycle training had taken eyesight checks in the last twelve months.

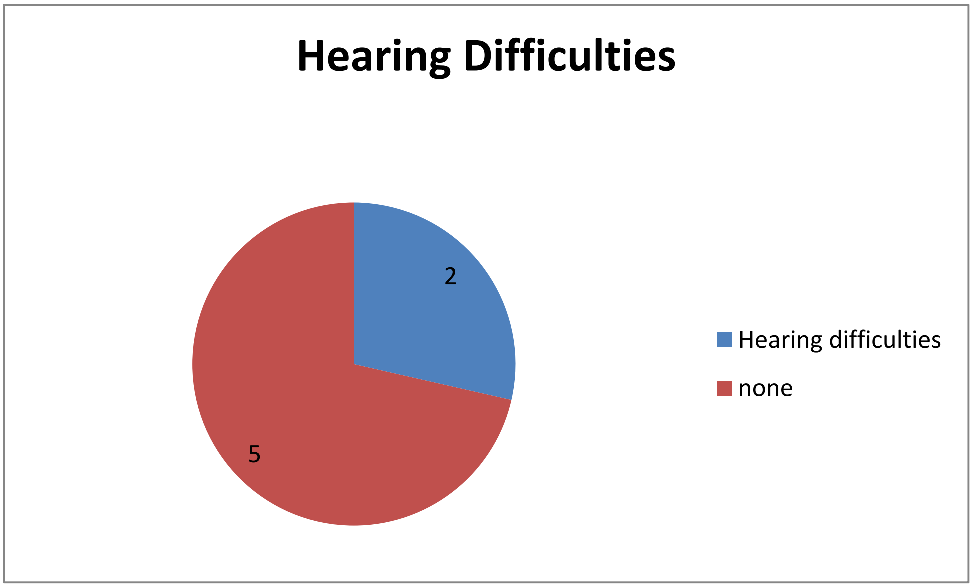
All the clients recorded no problems with eyesight because these are corrected with spectacles. One client noted that rain on the lenses of the spectacles obscures her view of the road ahead. She had to stop repeatedly to clear the rain from lenses on her spectacles, which may in itself increase collision risk. Some cyclists wear a peaked cap under their cycle helmet to reduce the amount of rain getting onto their lenses.

From the very early stages of UK Bikeability level 1, off road training, observation skills are factored into the training manoeuvres. For Levels 2 and 3 a large part of the training is focused on negotiating left and right turns at junctions. Observations are an important and integral part of this training. Clear instruction was given on what observations are needed and when to make them, whilst making a manoeuvre. This is taught in a way that helps the client to transfer the skills learnt, to new and different situations.

The major causes of collision in older drivers relate to inadequate use of observation and age related visual impairment. As a result, it is likely that the extent to which good observation skills are taught on UK Bikeability will help older cyclists avoid collisions and stay safer than if they were untrained.

For blind and visually impaired cyclists, a local charitable organisation called "Galloways Society for the Blind" offers the loan of free tandems and organise occasional off road 'taster' days, where clients can try out this type of equipment. Preston also has two local schemes where clients can try out bicycles with special adaptations for disabled people. These include recumbent bicycles and tricycles. These events are held in off road settings such as cycle paths on parks.

Figure 82 - Q26: Do You Have Any Hearing Difficulties?



It is significant that some of the clients in this survey stated that they did not have hearing difficulties, but during the training the instructor had to modify his speech so that he could be heard and understood. Good hearing is especially important for cyclists so that they can detect the presence of vehicles approaching from behind. The risk of not detecting other vehicles and cyclists increases when the client also has problems in turning around to look behind to make observations.

Action 6.9: The Effectiveness of Training and Awareness Workshops

Executive Summary

This section describes an evaluation of the "Drive Safely for Longer" scheme, offered to older drivers in Lancashire. "Drive Safely for Longer" is a refresher driver training scheme that helps older drivers reduce their risks on the roads and to extend their safe driving lives. It comprises two individual sessions with an Advanced Driving Instructor who assesses their general driving skills and provides advice about how to reduce their risk on the road. Tailored advice is given to address situations identified by the older driver as posing particular difficulty. Drivers are also given a copy of the Good Egg Older Person's Guide to Road Safety, (Road Safety Great Britain, 2011).

The evidence used to evaluate the scheme includes the assessment forms that were completed by instructors, evaluation questionnaires completed by drivers and two focus groups conducted by Brainbox Research. Data from 196 drivers was available for the evaluation.

"Drive Safely for Longer" successfully recruited over 500 older drivers. Just over half (57%) were male. Most were recruited via adverts in local newspapers. They were motivated to attend the scheme to prove to themselves and others that they are still a good driver, to update their skills and knowledge, and to increase their confidence of driving in specific situations, for example motorways.

The most common driving errors that older people who took part in the scheme made were failure to use their mirrors, not creating sufficient space around them, failure to scan the road ahead effectively, and not slowing down sufficiently on the approach to roundabouts and junctions. There is evidence that the "Drive Safely for Longer" scheme can reduce risk by improving driving skills. Nearly half of the comments instructors made on the follow-up drive were highlighting improvements that had been made while only a quarter were about faults that were remaining. However, because most of the drivers who attended the scheme were confident in their driving ability, none of the comments made by the instructors addressed giving up driving or making the transition to public transport, either generally or for specific driving situations. There is scope for further tailoring the sessions to address the difficulties that older drivers often have, such as such as mobility aids or situations they have more difficulty with, such as night-time driving.

Drivers were very positive about the scheme and about the instructors, who were described as professional, knowledgeable and as being able to reassure drivers who were nervous about being observed. Drivers were confident that they could apply the advice they were given and believed that the scheme had helped them to identify hazards on the road and that it would enhance their own driving. They valued the Good Egg Older Person's Guide to Road Safety and believed it to be both useful and easy to read. They were keen that "Drive Safely for Longer" be continued to be offered to drivers at a subsidised cost and believed that many older drivers have the potential to benefit from it.

Background

One of the practical outcomes of SaMERU is a driver training programme for older adults: "Drive Safely for Longer". This refresher driver training course helps older drivers reduce their risks on the roads and to extend their safe driving lives. Each driver who takes part in "Drive Safely for Longer" receives two individual sessions with an Advanced Driving Instructor during which their general driving skills are addressed as well as those situations identified by the older driver as posing particular difficulty. The first session lasts two hours and the second, which occurs three months later, lasts for one hour. Both these sessions are focused on a driving assessment with feedback from the instructor on general driving ability and the specific skills that the older driver needs to improve in order to reduce their risk on the road. The second session lasts an hour and is again based on a driving assessment with feedback on any progress that has been made and, where appropriate, further advice given. They also receive a booklet for older people (the Good Egg Older Person's Guide to Road Safety) and a copy of the Highway Code. "Drive Safely for Longer" is available free of charge to drivers age 65 and above who are residents of or regular visitors to Lancashire. Initial promotion concentrated on the districts of Lancaster, Wyre and Fylde. These three areas of Lancashire have the highest proportion of residents aged 65 and over and a relatively high number of collisions involving older drivers. Over 500 older drivers have been through the SaMERU "Drive Safely for Longer" scheme so far.

This section presents evidence on the effect that "Drive Safely for Longer" scheme has had in helping people to extend their safe driving lives, whether it encourages them, where appropriate, to consider alternative modes of transport, how effective the recruitment channels have been; and the likelihood that drivers would volunteer for the scheme should they have to pay for it. Recommendations for how the scheme could be improved are made and suggestions for materials for future evaluations of the scheme are provided.

Methods

The Lancashire team developed a series of evaluation tools that they used to collect evaluation data. They collected the data directly from 196 drivers and provided us with the following:

- Assessment forms from Drive 1 and Drive 2;
- A report on the number of drivers attending focus group feedback meetings;
- Driver profiling questionnaires, pre- and post-course plus an Excel spreadsheet containing the scores;
- An Excel spreadsheet containing responses to an evaluation questionnaire;
- An Excel spreadsheet containing responses to a feedback questionnaire on the Good Egg Guide; and
- Letters from drivers who attended the course.

In addition, we held two focus groups with drivers who recently had their first assessment. A facilitator from Brainbox Research guided discussions. Discussions included participants' perceptions of their driving, their reasons for attending the scheme, any barriers to attending, how they heard about the scheme, their perceptions of it and any changes they had subsequently made to their driving, and their perceptions of the value of the scheme.

Data Analysis

The way in which each of the data sets provided was used in the evaluation is described below.

Assessment Forms

These are standard Lancashire County Council assessment forms which contain 30 different points on the assessed driver, including use of controls, driving performance (e.g. moving off and stopping, positioning, progress, use of speed, concentration, observation, anticipation, space, time and hazard awareness) and knowledge of the Highway Code. Instructors can mark major and minor faults on the form and make comments on each of these points. There is also space for instructors to make overall comments and provide advice. These comments were tailored specifically for the driver and provided insight into the way in which they drove. The comments were content analysed, in which each comment is coded, then the codes grouped into categories. The number of drivers with comments in each category is then reported.

Focus Groups

Notes provided by the SaMERU team contained details of the number of participants who attended each of the 15 focus group feedback meetings that were held (a total of 232). A project team member had attended one of the groups and made notes on the points that were raised by drivers, which were made available to the Brainbox team. This information is summarised.

The two focus groups facilitated by Brainbox Research were audio recorded and key points from the groups that addressed the evaluation research questions are described.

Driver Profiling Questionnaires

These questionnaires ask about a range of risky driving behaviour, such as disregarding the speed limit, driving even though they are too tired or unwell to do so, feeling anxious when involved in unofficial races with other drivers, and driving without wearing a seat belt. On the supplied spreadsheet scores were grouped under different categories: fear; lapses, errors; risk; thrill; self-identify; Type A behaviour pattern; and aggression. The format of the spreadsheet was not compatible with our statistical package and so it was not possible to analyse the data further. As the questionnaire items do not address the aims of "Drive Safely for Longer" not using this data does not compromise the evaluation.

"Drive Safely for Longer" Evaluation Questionnaire

This brief questionnaire asks drivers a series of questions about whether they read the Highway Code provided, if they learnt anything on the course, whether the course helped them understand hazards on the road, whether it helped them identify their own driving habits and road safety awareness, their confidence to apply what they learnt, and whether the course will enhance their attitude and driving behaviour. Respondents answered using a four-point scale (not at all, a little bit, quite a lot and a great deal). There are problems with the wording of some of these questions as they ask more than one thing but nevertheless they tap directly into the aims of the course and the percentage of drivers who answered in each is reported. 196 drivers returned their questionnaire.

The Good Egg Guide

Drivers were asked for feedback on the guide, including the language used, how easy to follow it is, the value of the information it contains and whether or not they would recommend the guide to a friend. They were asked to respond on a five-point scale (strongly agree, agree, undecided, disagree and strongly disagree). The percentage of drivers who answered in each way is reported, and the comments they gave are summarised.

Letters From Drivers

Some of the drivers who took part in the scheme wrote to Lancashire County Council to provide additional feedback. The number of letters and the main points they made are reported.

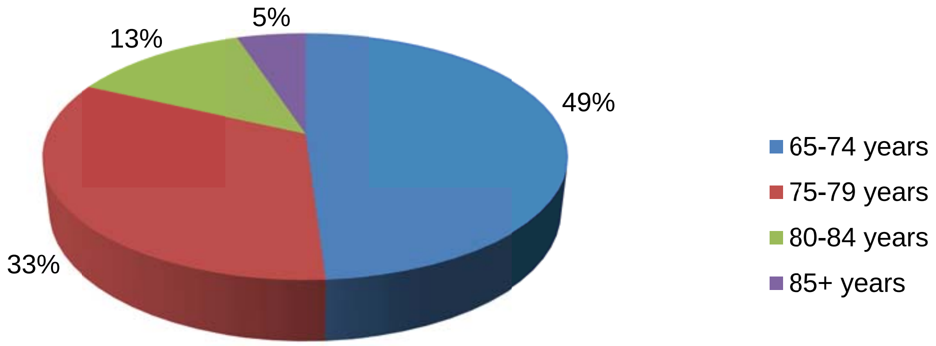
Results

The results are presented in three different sections that describe the drivers who took part in the scheme and how they were recruited, the way in which they drove during the first assessment drive, their experiences of the scheme, whether they implement the advice they receive about making their driving safer, and their perceptions of the booklet for older people on using the roads safely.

Who took part in "Drive Safely for Longer?"

During 2012, a total of 415 older drivers (57% males and 43% females) participated in the "Drive Safely for Longer" scheme. Figure 83 shows the ages of the older drivers that participated in the project. Around half of the older drivers were aged between 65 and 74, and a third were aged 75-79. The course was even accessed by a small number of drivers over 85 years of age. Almost all of the participants had held their driving licence for over 10 years.

Figure 83 - Percentage of "Drive Safely for Longer" Participants in Each Age Group



During focus groups participants were asked about the reasons for taking part in Drive Safely for Longer. Three common reasons emerged. The most common reason was to gain reassurance that they are a good driver. Many of the participants in the focus groups had previously worked in a role that involved driving, such as a police officer and HGV driver. They wanted to demonstrate, to themselves and to their friends and family, that they still have a high standard of driving.

"I thought I was a competent driver because I didn't learn until I was 44, when my husband died, and so I just wanted confirmation of that." (female)

"My son tells me I go too tight around corners but I do that in case something is coming the opposite way, so I tell him, well you're wrong." (female)

Another common reason discussed by participants was that they are aware that the road environment and vehicles themselves have changed substantially since they had learnt to drive and they viewed the scheme as a means of updating their knowledge. They described how there have been changes to speed limits and many more road signs and road markings, which they don't entirely understand. They have become increasingly conscious of the fact that their knowledge is outdated. They are also aware that they have picked up habits over their long driving career that may no longer be appropriate with the latest vehicle technology and driving advice, for example changing down gears when coming to a stop.

"The vehicles themselves have changed tremendously. You can now have vehicles that can get themselves out of a skid, and that was something that I was taught how to do by the police. They don't bother now because the vehicles can look after themselves." (male)

"There is a big difference from when we learnt to drive, with the changing road signs and the methods of driving. She was pointing out things that we were taught differently." (female)

A less frequently noted reason was to increase confidence when driving in specific situations, most commonly motorway driving but also for parking or for driving long distances. All the participants who gave these reasons were female.

"I don't like motorway driving so that's why I went on the course so I could build up a bit of confidence when I'm driving on motorways." (female)

Most participants did not believe themselves to be high-risk drivers and the groups discussed how their years of driving experience mean that they are more observant than younger drivers and therefore are safer. Nevertheless, they recognised that the course could be useful for them.

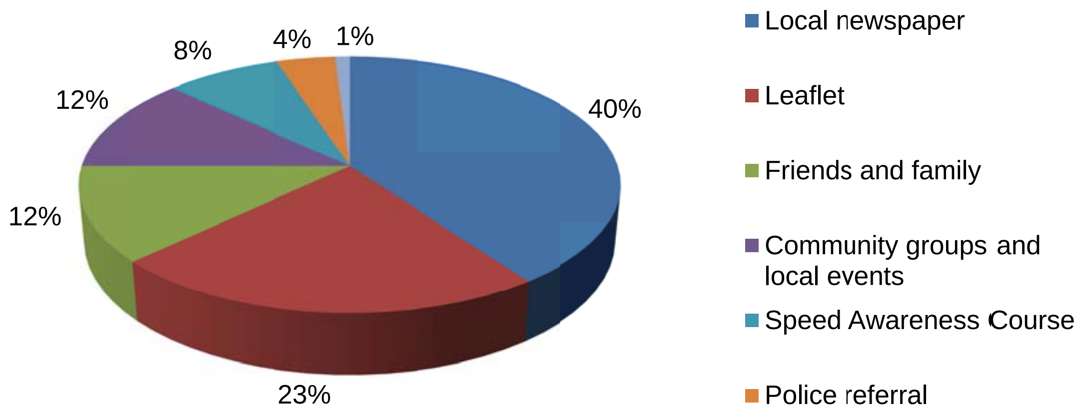
How were drivers recruited?

Lancashire County Council undertook a wide range of activities to promote the "Drive Safely for Longer" scheme. These included:

- A press release;
- Radio interviews given by the key "Drive Safely for Longer" project officer;
- Advertisements and advertorials placed in local newspapers;
- Leaflets distributed to GP surgeries, libraries, supermarkets and available at the Lancashire County Council Driver Training Unit;
- A briefing document for Lancashire Constabulary;
- Leaflets distributed by Lancashire Constabulary Road Policing Unit to drivers who were observed driving in a way that, while not illegal, raised concerns about their driving skills;
- Roadshows held at four town centre locations (Garstang, Lancaster, Lytham and Poulton-le-Fylde) during which printed materials and face-to-face advice were offered; and
- Presentations given and advice offered at older people's groups/centres.

Drivers were asked how they heard of the "Drive Safely for Longer" scheme; the proportion who reported each communication channel is shown in Figure 84. The majority of drivers were recruited through advertisements in their local newspaper (40%) and through a promotional leaflet distributed by Lancashire County Council (23%). Some drivers were informed about the project by friends or family members (12%), community groups or events that they attended (12%), or through a Speed Awareness Course that they had attended (8%). Police referral and local radio were the least commonly reported channels through which drivers heard about the course.

Figure 84 - Channels Through Which Drivers Heard About the "Drive Safely for Longer" scheme.



Participants in focus groups suggested that drivers could be told about the course (or similar ones in other areas) when they renew their driving licence when they reach the age of 70. They also suggested that GPs could be asked to distribute the leaflets to their older patients during consultations. They had all told their friends about the course and encouraged them to attend, but few had taken up the offer and they discussed how drivers who lack confidence may be reluctant to attend.

3.3 How did people drive during the first assessment?

In this section the comments that instructors made about driving performance are described. Most of these refer to faults and how they could be rectified, although a few praise drivers' skills. The proportion of comments that fell into each category is shown in Figure 85.

Use the mirrors

The most common fault that instructors noted was that drivers did not make proper use of their mirrors. Instructors described how all three mirrors should be used. The most common problem was not using the nearside mirror. Instructors explained that this mirror is particularly important for detecting cyclists. (22% of comments)

Create space

Another common point made was the need to create more space around the vehicle. Instructors explained that this would help make drivers safer by giving them more time to react to hazards. Some specific situations in which space is important were when passing parked cars and when waiting in a queue of traffic. Instructors suggested ways of drivers remembering this point, including citing the phrase "Tyres on Tarmac" to remind drivers that they should be able to see the tyres of the car in front in a queue of traffic. (19% of comments)

Scan the road

Instructors commented that drivers could use "funnel" rather than "tunnel" vision to scan the road ahead effectively. They talked about the use of observational scanning and linked this to using all three mirrors and to detecting hazards earlier. They highlighted how better observation would enable drivers to read the road better and to be more aware of road signs. (14% of comments)

Slow down on approach to hazards
Instructors commonly identified that drivers did not slow down sufficiently when approaching hazards, especially roundabouts. Instructors described how drivers should brake sooner and that this would help them to achieve a smoother drive. Several suggested that drivers remember "slow to flow" to help them recall that slowing down on approach to roundabouts would help drivers to flow into the traffic, rather than having to brake sharply and stop. (13% of comments)

Exemplary driving
This category represents the positive comments made by instructors around good driving. The ways instructors used to describe this driving were confident, courteous, considerate, smooth and fault-free. (10% of comments)

Speed
Instructors on occasion commented that people drove too fast. They made several suggestions about how drivers could be more aware of the speed limit by looking out for landmarks that indicate a 20mph or 30mph zone, such as street lights, churches and schools. They suggested that people use 3rd gear in a 30mph zone. While most of these comments (80%) related to people driving too fast, some (20%) related to people driving too slowly, with instructors commenting that other drivers may become frustrated at the slow speed. (10% of comments)

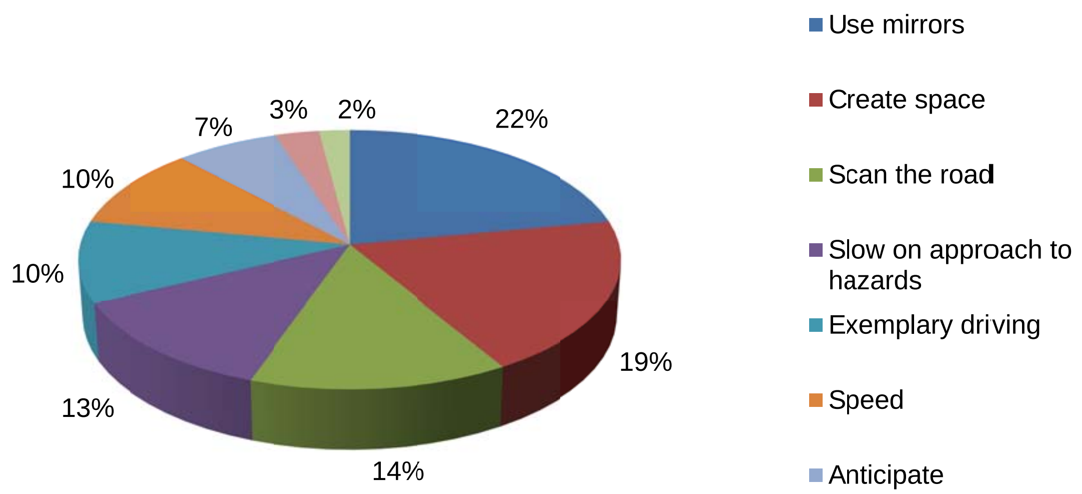
Anticipate
Many of the comments made were around the need to better anticipate what other road users are going to do. This category also includes advising drivers to help others anticipate what they are going to do, such as indicating earlier. (7% of comments)

Better lane discipline
This category includes comments and suggestions around better lane discipline and positioning within a lane. Examples include returning to the nearside lane after overtaking, better lane discipline at roundabouts, appropriate positioning when turning right, and being more aware generally of where the car is positioned. (3% of comments)

Confidence
Relatively few comments related to a driver lacking confidence. This was sometimes lack of confidence about driving generally, for example when somebody had not driven for some time. For other people lack of confidence was related to a specific situation, most commonly motorway driving. (2% of comments)

Others
Other comments were around poor concentration, the need to read the Highway Code, sharp braking, inappropriate use of gears, and the need for further training. (2% of comments)

Figure 85 - The Proportion of Comments About Drive 1 in Each Category.



What were people's experiences of Drive 1?

During the two focus groups conducted by Brainbox Research drivers discussed their experiences of the first part of Drive Safely for Longer: the first assessment drive. Some participants discussed being nervous about the prospect of driving an unfamiliar car (the promotional materials stated they would be supplied with a vehicle) and were relieved that they were able to drive their own car. There was a strong preference for being able to drive one's own car, even among those who were not nervous about driving an unfamiliar vehicle. A small number of participants discussed how they had been very nervous before their assessment and all talked about how their instructor had managed to put them at ease. All participants were impressed by their instructor's driving knowledge as well as their professional manner.

"It's constructive criticism from somebody who knows what they're talking about." (male)

Participants described what had happened during their first session. Many were surprised that the first hour of the two-hour session was taken up by completing questionnaires and talking about driving in general. While some participants described this as being valuable, for example it had highlighted that their knowledge of the highway code was out of date, all the participants suggested it would be more useful to spend the time on the road.

"The driving was pretty restricted because we didn't have two hours. I was only out for an hour. I think two hours out would have been better because it takes you half an hour to relax and they would pick up more because in that first half hour you're trying to drive very carefully and it's only later that you relax and start driving normally. Make it two hours actually driving." (female)

"It was advertised that it was a two-hour course and it's not two hours. It was an hour at home and then an hour in the car." (male)

"By the time she'd done the assessment and given me feedback there wasn't time to practise it." (female)

Participants described how they then had their driving assessed, followed by a feedback session with the instructor. This feedback focused on the mistakes they had made but in some cases also included advice about how to make driving more comfortable, for example moving the whole upper body (rather than the neck) to look all around the car, and to purchase a steering wheel aid. Where there was time, instructors then provided some tailored instruction on specific driving skills, such as parking, or specific driving environments, such as motorways.

"I'd told her [the instructor] that I don't like parking, especially when other people are watching, because I'm nervous I'll bump into another car, so we went to the supermarket car park and did some parking into parking spaces. She showed me a very easy knack. I can't do it from this side because I've got difficulties with my neck and shoulder but all I have to do is to get in the right position where I can reverse. That was very helpful, that was." (female)

Most participants accepted the feedback they received positively and welcomed the advice.

"She said I needed to use all three mirrors and she's right, I use my right mirror all the time but not the left because we didn't have a mirror there when I learnt to drive She was pointing these things out and it was very useful." (female)

Some, however, disagreed, for example explaining how they were using observational scanning but the instructor had not noticed and it would have been hard for them to tell where they were looking. Others justified the way in which they had been driving.

"We travel quite a bit on the motorway and we've decided to go slower to save petrol. So I got on the motorway and we were going along and there wasn't a thing on the road so I was taking my time, I was going at 50. And a lorry went past us and she said – do you not think you're going too slow. I said – I'm saving petrol. She said – go faster. (male)

Participants recalled some tips given by the instructors, for example "Tyres on Tarmac." Again, not all participants in the focus group agreed with this advice, as shown in the following exchange:

"If you left that much space in front of you there would be a traffic jam." (male)
"I thought it was a good suggestion, actually." (female)

Participants discussed how the amount of feedback was about right as if there had been a long list of things they should address they wouldn't remember them and they would be less likely to try to implement them.

Notes from the focus groups held by the SaMERU team showed that during the focus group feedback sessions drivers had discussed two main areas:

1. The faults that they had made during their drives, such as lane positioning, use of mirrors, the need to scan ahead, and speeding; and
2. General comments on the course, such as finding the course helpful and enjoying the course.

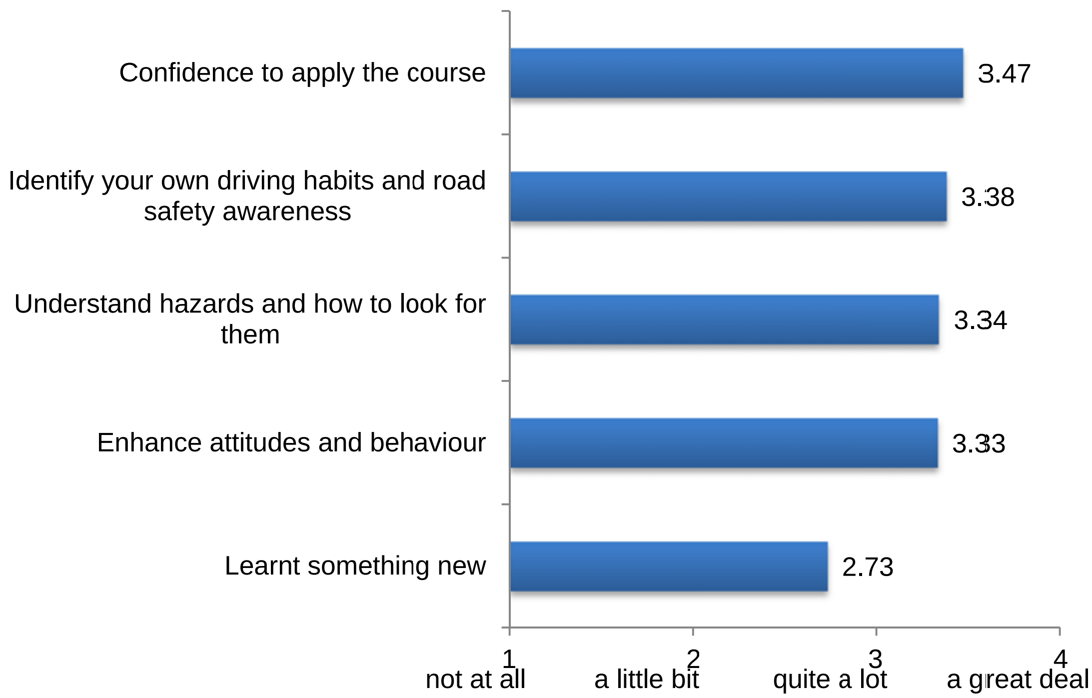
The evaluation questionnaire contained several questions that addressed drivers' perceptions of the course:

- How confident are you that you can apply what you have learnt on the course?
- Has the course helped you to identify your own driving habits and road safety awareness?

- Did the course help you to understand what hazards are and how to look for them?
- Do you think that the information that you have gained from the course will enhance your attitude and driving behaviour?
- Have you learnt something that you did not already know?

The mean responses across all 196 drivers who responded are shown in Figure 86. Overall, drivers were very positive about the course. Respondents were confident that they could apply what they had learnt: 50% reporting they have a great deal of confidence; 47% that they have quite a lot of confidence; and 3% that they have a little bit of confidence. The course helped them a great deal (44%), quite a lot (50%) or a little bit (5%) to identify their own driving habits and road safety awareness. It helped them a great deal (42%), quite a lot (50%) or a little bit (8%) to understand what hazards are and how to look for them. Similarly it helped them a great deal (41%), quite a lot (50%) or a little bit (8%) to enhance their attitude and driving behaviour. Respondents were less positive about having learning something new with 12% reporting they learnt a great deal, 50% reporting they learnt quite a lot, 36% that they learnt a little bit and 2% that they didn't learn anything new. Comments made by some respondents highlighted that while they had not learnt anything new, they had become careless about certain aspects of their driving and so it had nevertheless been a useful experience.

Figure 86 - Mean Scores From the Evaluation Questionnaire



Focus group participants were asked if there were any ways the course could be improved. No suggestions were made during the Lancashire County Council focus groups. Four suggestions were made during the Brainbox focus groups:

- Spend more time on the road during the first session;
- Send people pre-course reading;
- At the beginning of the first session agree the situations that the driver wants help with and ensure there is enough time to cover those areas;

- Revise the leaflet to reassure people that they will not be tested on the Highway Code.

Hence participants were very enthusiastic about the content and the value of the course. They were very keen that Lancashire County Council continue to make it available to older drivers. They were also keen that the course continue to be available without charge, as they were concerned that people would be deterred from attending if they had to pay.

Do people implement the advice they receive?

The comments that instructors made about driving performance in the follow-up drive, around three months after the first assessment, were content analysed. Five different categories were identified from the comments, described below, and the proportion of comments in each category is shown in Figure 87.

Driving has improved

Instructors commented on the improvement in driving performance since the first assessment. A wide range of improvements were identified, including better road positioning, both generally and for specific situations such as overtaking parked cars and on roundabouts. Drivers were reported as being smoother more confident drivers. They were better able to anticipate hazards and create more space. They used their mirrors more and approached roundabouts and junctions at a more appropriate speed. (42% of comments)

Problems remain

In many cases the instructors noted that there remained some problems in the way people drive. Examples include the speed at which drivers approach junctions, not noticing speed limits, inadequate use of mirrors, lack of scanning ahead, poor positioning on the road, both generally and at roundabouts. (23% of comments)

Practice needed

For many drivers the instructors noted that while there had been some improvements the driver needed to continue working to improve the aspect(s) of driving they had been encouraged to work on. As well as very specific aspects, such as use of mirrors and road positioning, this category included general advice such as applying COAST (Concentration, Observation, Anticipation, Space and Time (16% of comments).

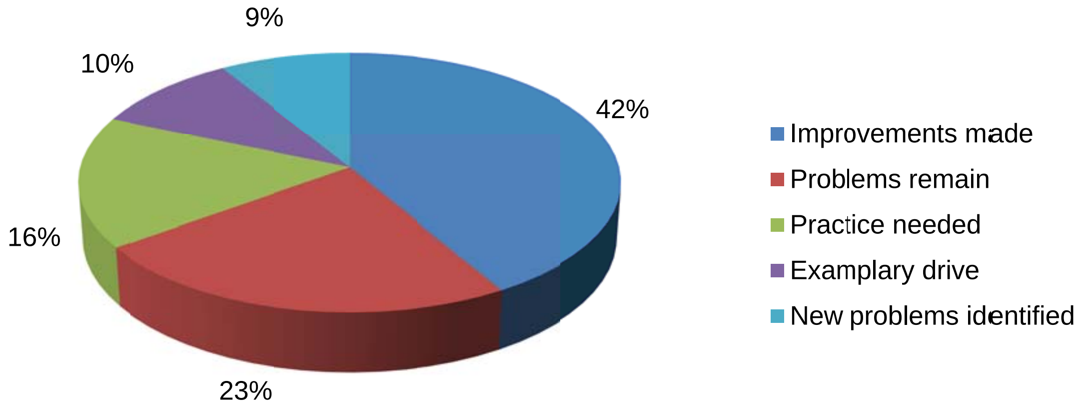
Exemplary drive

For some drivers the instructors praised their high standard and described them as confident, courteous, smooth, safe drivers. On occasion the instructors noted that their standard of driving was such that they would have passed an Advanced Driving Test. (10% of comments)

New problems identified

Some of the problems identified on the follow-up drive were not commented on in the first drive. In a small number of cases these problems were identified following practice on a road environment or a manoeuvre specifically identified as needing practice by the driver. In other cases is might be that the instructor had not wanted to overwhelm the driver with too many areas that needed to be improved, so highlighted new problems after the previous ones had been rectified. (9% of comments)

Figure 87 - The Proportion of Comments About Drive 2 in Each Category



Participants in the focus groups discussed how the scheme helped them be more aware of the ways in which their driving has adapted to changes in the road environment and therefore what they should be more aware of when driving in future.

"She gave me some very very good advice. She talked to me about dictation driving; she said it makes you more alert. Wow, she's right. Wow, we should tell everybody about that." (male)

The instructors had highlighted some areas they need to improve in order to reduce their risks on the road and many had implemented the changes they suggested.

"I am using the mirrors more now and I'm leaving more space because she pointed out several reasons why I should be leaving more space. There were a few things from the safety angle that I just wasn't aware of." (female)

Those drivers who had worked on a specific skill or driving situation for which they lacked confidence also reported improvements.

"I have definitely got more confidence on motorways now. I drive faster." (female)
"I don't particularly like driving at night but I do do it, and she said – well start doing commentary. Also, scan rather than watch the road ahead, look all around you." (female)

Participants were asked whether the course had helped them recognise any situations they don't want to drive in and will avoid in the future. Nobody described this situation, but instead, some discussed how they now recognise the importance of practising their driving in situations they have less confidence in. For example, several participants identified that their husbands tend to drive on motorway journeys and the course has helped them recognise that they need to keep up their motorway driving.

"I'm a lazy driver and I'm quite happy to be driven. I have realised that I need to keep up my motorway driving. Now I make sure I drive every third time we go on the motorway. She [the instructor] was very positive, she said – keep your driving up. You're a safe driver but you need to keep your driving up. It left you feeling very positive." (female)

Participants discussed how they rely on driving to maintain their social contacts and their independence and therefore their quality of life.

"The car is a lifeline to older people." (male)
"You use public transport to do something that is essential but to give you the social contact you need your own car, whether it be to see family, or activities, to keep you independent and to get out." (female)

Eleven people who had attended "Drive Safely for Longer" took the trouble to write to Lancashire County Council to thank them for the course or to comment on the course and the difference it had made to them. They described the changes they had made to their driving, how they are more aware of how vehicles and the driving environment have changed, the expertise and professionalism of the instructors, and how important driving is to them.

Do drivers value the Good Egg Older Person's Guide to Road Safety?

Drivers were asked to complete a brief evaluation questionnaire on the Good Egg Older Person's Guide to Road Safety (Road Safety Great Britain, 2011) that was provided to them as part of the course. Nearly all the drivers (96%) found the information in the booklet useful: 32% strongly agreed and 64% agreed. Drivers agreed (64%) or strongly agreed (9%) that the booklet contained some new information, while 14% were undecided and 13% disagreed. Comments they made indicated that most of the information in the booklet acted as a useful reminder or as reinforcement to what they had already learnt, rather than new material. Drivers found the booklet easy to follow (99% agreed or strongly agreed) and found the language appropriate (98% agreed or strongly agreed). Comments made by drivers indicate that some found the language, specifically the use of "we" rather than "you" a little patronising. Other comments drivers made highlighted how interesting, informative and useful the booklet was, either generally or specific aspects of it, how it has made them feel more confident, or how it should be made available to all older people. Drivers found the sections on being safe as a pedestrian or a public transport user useful as well as the sections on driving.

Conclusions

The data provided by Lancashire County Council and additional data collected by Brainbox Research has demonstrated the following points.

- There is evidence that the "Drive Safely for Longer" scheme can improve the standard of older people's driving. Nearly half of the comments instructors made on the follow-up drive were highlighting improvements that had been made while only a quarter were about faults that were remaining.
- "Drive Safely for Longer" therefore has the potential to extend the amount of time older drivers can drive safely.
- The most common driving risks that older people have are failure to use their mirrors, not creating sufficient space around them, failure to scan the road ahead effectively, and not slowing down sufficiently on the approach to roundabouts and junctions.
- The ability to drive is extremely important to older people. They describe how driving enables them to remain independent and allows them to maintain their social life and to visit their families.

- The instructors were perceived as professional, knowledgeable, and as being able to reassure drivers who were nervous about being observed.
- Drivers prefer using their own car than one supplied for them.
- The most effective ways of recruiting drivers to the scheme were through adverts in local newspapers and through leaflets that were distributed via community groups and venues such as libraries and GP surgeries.
- Drivers attending the course did so primarily to prove to themselves and others that they are good drivers. A small number attended to gain confidence or to address a specific problem. As such, there is potential for greater take up by those drivers who could benefit most from it.
- Because most of the drivers who attended the scheme were confident in their driving ability, none of the comments made by the instructors addressed giving up driving or making the transition to public transport, either generally or for specific driving situations.

Recommendations

- There is evidence to continue offering "Drive Safely for Longer". Several faults were identified that place drivers at higher risk and the improvements made suggest that risk has been decreased.
- Drivers would be unwilling to pay the full cost of the scheme so maintaining a subsidy is important.
- Revise the promotional materials so that they are less likely to attract drivers who want confirmation of their high driving standard and more likely to attract drivers who are nervous at the prospect of having their driving assessed.
- Revise the assessment so that it specifically includes areas of relevance to older drivers, such as mobility aids or situations they have more difficulty with, such as night-time driving.
- Cease running the focus group feedback session. Instead, a session on public transport options could be introduced for those drivers who are considering driving less frequently.
- Cease collecting driver profiling questionnaire data.
- Make some changes to the evaluation materials as indicated below:

Suggested changes to evaluation questions

Some of the respondents noted that they found the wording of the questions on the evaluation form confusing. We suggest the following questionnaire items could be used as part of a single evaluation questionnaire completed at the end of the "Drive Safely for Longer" course. Suggestions for the response options are shown in brackets.

1. How useful did you find the first driving session?
   (not at all useful, fairly useful, very useful, extremely useful)
2. What changes did the instructor in the first driving session suggest that you make to your driving? (open question)
3. Did you make any of these changes to your driving?
   (none of them, some of them, all of them, none yet but I will do in the future)
4. How confident are you that you can continue making these changes in the future?
   (not at all confident, fairly confident, very confident, I didn't make any changes)
5. How useful did you find the second driving session?
   (not at all useful, fairly useful, very useful, extremely useful)

6. What changes did the instructor in the second driving session suggest that you make to your driving? (open question)
7. Compared with before the course, how good at identifying hazards on the roads do you think you are?
(much worse, a little worse, the same, a little better, much better)
8. Please tell us why? (open question)
9. Compared with before the course, how safe a driver do you think you are?
(much less safe, a little less safe, the same, a little safer, much safer)
10. Please tell us why? (open question)
11. How do you think the Drive Safely for Longer course could be improved?
(open question)

Action 6.10 Targeted Messages and Reaching Communities

Introduction

This section considers previous and ongoing targeted message campaigns focusing on road safety in general. It does not specifically relate to older people.

The assessment of the effectiveness of targeted messages implies the verification of behavioural changes. However, it is only possible to accurately analyse their effectiveness, in terms of a reduction in the number of collisions, by long term studies over several years.

A study, “Safety in Italy”, was carried out by Ilvo Diamanti (2010), an Italian sociologist, on the significance, image and reality of the social representation and media attention of safety issues. Through comparative analyses carried out in 2009, it emerged that in Italy the fear of being injured in a road collision is very low compared to the fear of injury through violence in the street. However, official statistics indicate a higher number of victims due to road collisions than due to violence.

Table 35 - Campaigns Prior to September 2010 (prior to the start of SaMERU)

PARTNER	LOCAL CAMPAIGNS	NATIONAL CAMPAIGNS
IFSTTAR (Paris, France)	✔	✔
TU Dresden (Germany)		✔
City of Burgos (Spain)	✔	✔
Lancashire CC (UK)	✔	✔
Southend-on-Sea BC (UK)	✔	✔
City of Modena (Italy)	✔	✔

Table 36

ITEMS	DESCPIPTION
Title of the initiative	Presented in original language with English translation
Period and duration	
Target group	Tailored to specific groups (road user types, age categories)
Location	City (region), country where the campaign was carried out
Organising body	
Short description of the activity	
Main message	
Evaluation procedure	Evaluation procedures and results
Communication tools	Media plan of the campaign, mass media campaign/personally contacting people
Language	Tone of the message (fear-based, educative, humorous etc.)
Comments	Website, other information

Main Characteristics of the Campaigns

The following list presents a summary of the main campaign characteristics presented by the partners. Overall, 59 campaigns were presented, of which 28 were local and 31 national. The full summary can be found in the Appendix on the SaMERU website.

It should be noted that four campaigns (2 French, 1 UK and 1 Italian initiative) out of 59 campaigns were targeted at the elderly population. However, it needs to be mentioned that this report does not represent a comprehensive collection of campaigns carried out in the partner countries.

The following tables of campaigns are shown in the Appendix on the website;

Table of the main characteristics of the campaigns
Table of campaigns by partner country and dissemination level :-

- Paris, France
  - Local and National campaigns
- Dresden (Germany)
  - National campaigns
- Burgos (Spain)
  - Local and National campaigns
- Southend-on-Sea (United Kingdom)
  - Local campaigns
- Lancashire (UK)
  - Local campaigns
- UNITED KINGDOM
  - National campaigns
- Modena (Italy)
  - Local and National Campaigns

Table of local campaigns carried out during the project:-

- Burgos – Spain
- Lancashire – United Kingdom
- Southend on Sea – United Kingdom
- Modena – Italy

Table 37 - Main Characteristics of the Campaigns

<table>
<tr><th rowspan="2">ITEMS</th><th rowspan="2">Paris (France)</th><th rowspan="2">Dresden (Germany</th><th rowspan="2">Burgos (Spain)</th><th colspan="2">United Kingdom</th><th rowspan="2">Modena (Italy)</th></tr>
<tr><th>Lancashire</th><th>Southend-</th></tr>
<tr><td>Target group</td><td>Older adults
Students (20-30years)</td><td>Children, young drivers, cyclist</td><td>School students (newly licensed) car driver
young people</td><td>Young drivers, nursery/primary school children</td><td>Children, motorist, cyclist</td><td>children, young people, car driver</td></tr>
<tr><td rowspan="2">Dissemination level</td><td rowspan="2">3 local campaigns
2 national campaigns</td><td rowspan="2">5 national campaigns</td><td rowspan="2">3 local campaigns
5 national campaigns (3</td><td>4 local</td><td>11 local</td><td rowspan="2">7 local campaigns
6 national campaigns</td></tr>
<tr><td colspan="2">13 national campaigns</td></tr>
<tr><td rowspan="2">Organising body</td><td rowspan="2">Local: city /regional council

National: Ministry, Road Safety</td><td rowspan="2">National Road Safety Association, insurance association, Ministry of Transport</td><td rowspan="2">Local: various stakeholders together
National: Spanish Traffic</td><td>Local: County council</td><td>Local : in house</td><td rowspan="2">Local: City council and City police
National: Ministry of Transport, Automobile</td></tr>
<tr><td colspan="2">National: Department of Transport, National Road Safety Organisation</td></tr>
<tr><td>Evaluation</td><td>no</td><td>-//-</td><td>some were evaluated</td><td>2 out of 6</td><td>-//-</td><td>no</td></tr>
<tr><td>Main Message</td><td>Safe road behaviour, negative effects of alcohol, drugs, etc.
Sustainable mobility
Safety, mobility and autonomy of older adults</td><td>Awareness of vulnerable road users, alcohol, velocity, good/safe state of the vehicle</td><td>Alcohol
Driving behaviour</td><td>Risk, correct behaviour on the road (road education), awareness of vulnerable road users, sustainable mobility</td><td>Safety education risk, correct behaviour
Sustainable travel</td><td>Road safety education, alcohol, safe car, vulnerable road users</td></tr>
<tr><td>Communication tools</td><td>Local: leaflets
National: TV, Radio, Press</td><td>Internet, information material</td><td>National: radio, TV
Local: informative material, social network</td><td>Conference, web, classroom, awards, guide,</td><td>-//-</td><td>Local: informative material
National: radio, TV, testimonials</td></tr>
<tr><td>Language</td><td>Educational , humorous</td><td>-//-</td><td>reassuring</td><td>fear, empathy, fun (kids)</td><td>-//-</td><td>Informative, reassuring</td></tr>
</table>

Action 6.11, 6.13 Propose Effective Messages that Promote a Culture of Road Safety Benefitting the Elderly Road User and Assess the Benefits by Inviting Comments from Both Elderly and Other Road Users

Modena's surveys included questions on the level of knowledge of road safety campaigns carried out by national and local governments. The results indicated that few senior citizens were aware of initiatives and messages aimed at road safety. In fact, only 12% of them said they knew about road safety initiatives and 35.3% of these declared they knew about single day events on the subject, for example road safety stands in the street. However, 33.4% knew about road safety events at schools and 17.7% about leafleting initiatives outside schools. It is interesting to note that leafleting campaigns outside schools were received favourably by the elderly focus groups because it was believed that the contents would be discussed with their grand children.

A third of the respondents to the questionnaires stated they would be prepared to attend driving courses and theoretical lessons. However, the focus groups thought that traditional classes for the elderly were too gloomy because they only highlighted the diminution of driving skills with age and were therefore a little depressing for the elderly. It was thought that they would have felt less old by attending more general courses opened to all, because senior citizens do not want to feel segregated as a different category of road users and regarded as a risk group.

The focus groups concentrated on road safety issues, including risk perception and awareness of road safety campaigns, in order to discover how to raise awareness of road safety in senior citizens. They were facilitated by a moderator who gathered detailed information about the participants' opinions and perception on road safety.

The group discussions were structured around a set of predetermined questions aimed at stimulating an open discussion on issues listed below:

- The elderly population in relation to road safety (expected duration of 60 minutes)
- Perception of road safety, role of the elderly in the traffic ambience, reasons for choosing various modes of transport
- Analysis of information materials produced in the area
- Investigating elements that might be more effective for road safety campaigns in terms of content, distribution methods, channels used
- Gap between the information received and chosen behaviour

A trained psychologist led the two focus groups each of two hours duration.

The sample components fulfilled the following criteria:

- Living in Modena (not in the nearby towns)
- 50% men; 50% women
- Aged 65 to 80, divided into two groups, aged 65 - 70 and 71 – 80
- Usually travelling in the city on their own
- With the following road user patterns: 40% who mainly use the car to move around the city; 30% who mainly use the bicycle to move around the city and 30% who mainly go on foot or use buses.

The transport options offered were based on the results of the telephone survey carried out in March 2012.

Results arising from focus groups raised some issues, for example road use by gender, the road is seen as a "dangerous" but also beautiful place, opinions on the use of bicycles, cars, buses, going on foot, the feeling when travelling on the road.

It is possible to conclude that:

- The over 65's in Modena have a high level of civic awareness
- Residents of Modena make many trips through the city
- They would like road safety measures to focus on segregating and managing road space according to the needs of the different categories of road users
- Improved maintenance of road surfaces, road signs and road markings
- More police enforcement especially with regard to cycling offences
- Continued road safety training and refresher courses
- Monitoring of areas of high collision rates

The communication of road safety information should be multi-channel, so that no senior resident of Modena may say "I did not know about it!". Communication must reach all age groups and not just senior citizens. This is to avoid senior citizens feeling isolated, because they like to feel part of the whole community. Road safety initiatives must be communicated in locations that are convenient and easily accessible for the elderly.

Actions Carried Out: Strengths and Weaknesses

The questionnaire developed in SaMERU has been used to obtain the views of elderly road users in three different countries, Burgos, Modena and the UK. We believe it is the first time that this has been done in this field and the results are given in Work Package1.

Modena Quality Agreement

In 2009 the Municipality of Modena signed a Quality Agreement with the city associations representing senior citizens, elderly committees, retired people and trade-unions. That document provided a framework for mutual commitments for local government to organise information events for the benefit of older people.

This Agreement led to events focused on The Highway Code and the safe use of medication while driving. Events were held in meeting centres and some parishes and involved senior citizens and trade-unions representatives. The experience has been quite positive with an average attendance of 30/40 elderly citizens at each meeting. The meetings were traditional lectures given by the Municipal Police and a pharmacist. However, they were limited initiatives and it was necessary to carry out further actions to improve road safety.

In order to strengthen road safety activity in Modena, it was decided to erect gazebos on the streets in collaboration with the Municipal Police. It is through this initiative that road safety street information points were erected with the objective of testing the public's level of knowledge of The Highway Code using a questionnaire. This took place in the presence of Municipal Police Officers who reviewed the completed forms and offered explanations and clarification.

Street information points have also been used by other SaMERU partners and experiences shared.

The strength of these initiatives lies in bringing together elderly communities through their curiosity to discover ways of improving their safety on the road and by demonstrating that public institutions are closer to the public. Effectiveness may be improved by organising these initiatives at the same time as other events that attract a high presence of elderly people.

Although there is a limit to the amount of detail that may be conveyed, the value is in conveying a general road safety message to the elderly.

Practical training

Training courses have been proposed for car drivers, cyclists and users of mobility scooters. The relevant methodologies were different and are described elsewhere in this report. The desire to participate in safe driving courses emerged in surveys but participation in the courses did not always reflect the desire indicated in the surveys.

In retrospect, we considered whether compulsory attendance at practical driving courses would be necessary or whether older drivers could be persuaded by finding the right allies, for example relatives, health professionals or the police. Our recommendations, which are linked to other areas, including cognitive decline and issues surrounding medication, are shown at the beginning of this report.

What do elderly road users want?

- They do not view themselves as a separate category of road user but would like to be seen as active and valuable members of the community.
- They would like to be reminded about the provisions of The Highway Code and, in particular, advised about new regulations.
- To become less dependent on the car and assisted in the use of alternative more sustainable forms of transport.
- To undertake practical driver training, improve awareness of potential risk situations with other road users and develop driving skills.
- Receive training in adopting self-protecting behaviours as road users.

Where do they want to be contacted?

- In places they visit regularly, for instance in post offices or shops with leaflets on display
- Outside schools and in other places where they carry out their role as grand-parents
- Road safety meetings of all age groups
- Other places where the local community regularly meets

What to do then?

- Promote inter-generational road safety activities

- Involve the elderly as stakeholders in order to better understand the elderly road user profile and provide appropriate targeted messages
- Distribute specific materials to older drivers on an individual basis to ensure widespread coverage
- Involve professionals, such as the police, transport officials and health professionals
- Arrange refresher initiatives to update knowledge of The Highway Code and encourage improved behaviour on the road
- Communication should be multi-media, so that no senior citizen may say, "I did not know about it!"
- Communication must also reach all age groups, so as to avoid the fear of exclusion and isolation amongst senior citizens who prefer to be together with other age groups
- Road safety initiatives should take place in convenient places frequented by the elderly

Action 6.12 Investigate Existing Practice in the Partner Countries for Reaching Out into Communities to Improve Awareness of Road Safety Issues

Burgos

Title: Bike Training Workshops Mainly Focusing on Elderly People
Brief description of the action:

A five day training course was developed in 2010 and 2011 in the city. It consisted of two hours per day in two groups; one in the morning and another in the evening from Monday to Friday.

Each instructor had a different methodology. In the first year, the instructor helped the classes with machinery to control balance. In the second year, the instructor asked the participants to use the skills they had previously acquired without the assistance of machinery to control balance.

The majority of participants had little experience of cycling when they were younger, although some had a limited amount of experience. The bicycles were from the bicycle loan system in Burgos, and the participants had to wear a helmet as well as other security elements.

In both years, the courses were announced under the umbrella of the European Mobility Week activities. This was good timing because more than 10,000 leaflets were distributed among residents, including many in the civic centres, where elderly people frequently meet.

Participants

Although the courses were not advertised specifically for older people, in the first year 9 women attended aged from 45 to 55, 24 women from 55 to 65, 5 women from 65 to 75 and one woman of more than 75. The second year figures show 11 women aged from 50 to

60, 7 women 60 to 70 and one in her 70's. The courses were advertised for both male and female participants but only one man attended and he left the course after the first day. This bias towards female participants may be explained by the fact that possession of a bicycle after the Second World War was considered a luxury in Spain. Due to social conventions of the time, it was the male members of families that took to cycling when money became available to purchase a bike. Consequently, females did not generally have the opportunity to learn to ride one.

Lancashire

Title: Driver Training

Brief description of the action:

A two-part practical driving course consisting of a two hour lesson followed by a one hour lesson three months later. The aims were:

- Reduce the risk of road user casualties by improving the driving skills of elderly drivers.
- Give individual drivers the opportunity to address their own particular concerns by practising driving under supervision, in a safe environment and build confidence.
- Assess the effectiveness of the training; to establish whether driver behaviour has changed and whether the participants have become safer drivers.
- To make recommendations for the effective design and delivery of future training courses for elderly (65+) drivers across EU member states.

Initial contact with drivers was through press releases, leaflet distribution to doctors' surgeries and leaflets available to the police to offer the course to a driver who has been witnessed by the officer causing a "minor" misdemeanour not an offence.

Drivers would phone and leave details for an Advanced Driving Instructor (ADI) to call back and arrange a date and time for their free driving session.

A focus group was held after the first drive to discuss, with other participants, what they learned and what they thought of the session. A follow up practical session of one hour took place 3 months after the initial assessment. The number of participants was 660 up to February 2013.

Interest from participants

Participants were very thankful for the free course as it allowed them to see what standard they had attained and whether they were still safe to drive.

Most were willing to pay but the true worth of the course was only discovered after taking part. It was seen as informative and worthwhile. Some would like it to be available in future to test their skills and knowledge again.

This course needs to be directed at the right people who would benefit most from the course. Those pulled over by the police are given the opportunity to enrol on the course. As they know it is optional, most don't participate. Something is required to engage with these people to persuade them of the positive and beneficial factors and outcomes of taking the course.

Title: Road Shows

Brief description of the action:

A series of road shows to promote and recruit participants for driving and cycling courses for ages 65+ were organised by Lancashire County Council and Lancashire Constabulary.

Road safety and travel advice were offered, promotional items distributed and participants recruited for free training courses and consultation exercises for Lancashire's residents aged 65 and over.

Objectives:

- Promote driver and cycle training
- Promote the use of public & demand responsive transport
- Recruit volunteers to complete a travel diary
- Promote safe use of mobility scooters
- Encourage regular sight tests

Promotional resources available included: "Drive Safer for Longer" leaflets, Travel Diaries and Highway Codes for Mobility Scooter Users (Road Safety Great Britain, 2012). The number of participants was 630. At these events about a third of the participants took some or all the promotional materials.

The road shows should be in the right location to attract older people and at a convenient time of day. They should coincide with market days, or other public attractions that older people would be likely to attend.

Title: The Older Persons Guide to Road Safety from the 'Good Egg' Series of Publications (Road Safety Great Britain, 2011)

Brief description of the action:

A Road Safety Guide was produced aimed at older people, providing information to keep safe on the road and to keep mobile for longer.

The aim was to help older people to remain safe behind the wheel for as long as possible and encourage them to use different modes of transport to maintain their mobility and health. Lancashire County Council was responsible for this action, which was endorsed by Road Safety GB.

The Guide was distributed to older people through driver training courses and road safety events. People were asked to complete a questionnaire to help evaluate the Guide. Respondents completed and returned 106 evaluation forms.

The feedback was overwhelmingly positive, however some points were made that could be used to improve the Guide in future revisions:

- Some found the Guide repetitive and over simplified.
- Others did not agree with the terminology such as "we" and "us", they would have preferred "you" and "yours".
- Some parts were felt to be patronising.

- One person felt too much was covered, with not enough detail.
- In the 'Wise Walking' Section – more advice was requested when using roads without a footway, particularly in rural areas where several people are walking together.
- Would a separate short punchy leaflet be better?
- Many people would benefit from a wider distribution as the information provides practical help in going about daily life as a driver, cyclist or pedestrian.
- Possibly a small section could be added in the pedestrian safety section regarding the control of pets and other animals on the highway.

Southend

Title: Safe Winter Driving

Brief description of the action:

A winter driving campaign promoted safer winter driving. Members of the public were offered a voucher for a free tyre check at Alley Cat Tyres, a free ice scraper and information about safe winter driving.

Southend Borough Council organised the campaign in partnership with Alley Cat Tyres.

A press release attracted more than 500 participants to a promotional day on the ground floor of the Civic Centre and other promotional days in the High Street.

The event was well received by all members of the public and it also gave the Southend Road Safety Team the opportunity to speak to drivers of all ages.

If this event were to be repeated at a future date we would carry out more promotions to businesses, doctors surgeries and libraries.

Title: Bikeability Cycle Training Courses

Brief description of the action:

Southend offered Bikeability cycle training courses for all at various locations within the Borough. There were also courses called "Learn to ride". The Borough Council organised these courses which were open to all age groups in Southend. Bikeability was promoted as an active senior event at Garons Sports Centre and via the Cycle Southend website. A range of bicycles was available for use.

These training courses are ongoing and have been well received by older residents. The oldest person learning to ride was 83 and people over the age of 55 regularly attend these courses.

Indoor training would be beneficial for this age range during the winter. Smaller bikes with low step through 'Dutch style' frames would be beneficial as they are easier to ride**.**

Modena

Title: Road Safety Information Points

Brief description of the action:

Road Safety Information Points were organised in the old town centre in Modena in April 2011 and April 2012, as part of the Ecological Sunday events and also in September 2011 and September 2012, as part of the traditional local celebrations dedicated to people over 65 years, entitled, Oltre gli Anni (Later Years).

At the information points, there were City Policemen and volunteers of the Association, Non da Soli (Not Alone), which is a group of elderly volunteers that works with the local administration to support victims of crimes such as thefts, fraud, etc. and volunteers of the Association of retired City Policemen.

Local Policemen distributed information on The Highway Code and invited participants to answer a questionnaire to test their knowledge of road safety regulations.

At the information point, the following materials were distributed:

- Questionnaires on The Highway Code
- Promotional information on the safe use of bicycles
- Guidance on how to safely negotiate roundabouts
- Safety equipment to improve the visibility of cyclists after dark and in fog (rear reflector bracelets and portable lights for bicycles)
- Information on how to transport children safely in cars
- Stickers 'Bimbo a bordo' – 'Child on board'
- Brochures advising against driving under the influence of alcohol and drugs

This initiative was developed in order to further spread knowledge of The Highway Code in places where elderly people regularly meet. There were 232 responses to the questionnaires on The Highway Code during 4 events organised between 2011 and 2012.

The questionnaire on The Highway Code, together with Travel Diaries completed by respondents during the events, were tools that mainly promoted participation and drew attention to the issue of road safety, which for the first time, was focused on older age groups and considered all modes of transport.

It emerged from the dialogue with older citizens, that responses were unexpectedly heartfelt and there was a great deal of interest in updating knowledge of The Highway Code. Interest in the information points was high, so this action is likely to be repeated on an annual basis.

Title: Safer Driving for Elderly at the Modena Autodrome
(GUIDA SICURA PER LA TERZA ETA' presso l'autodromo di Modena)

Brief description of the action:
The 'Guida Sicura per la Terza Eta' training course is an experimental project targeted at the over-65's, both male and female. Its purpose is to provide an update on The Highway Code currently in force to people who have held a licence for a very long time. In addition, it is to assess the effects of time on driving habits by means of a few, simple driving exercises.

The courses were held at the Modena Autodrome with the organisational and technical support of professional driving instructors. The training course was designed by the Autodrome staff, who were well aware they were developing a new and innovative method to improve the driving skills of elderly road users.

The "Safe Driving Course" and "Refresher Highway Code Course" sessions were held on 22 June 2012 and 14 December 2012 at the Marzaglia Autodrome in Modena.

The courses were open to people over 65 years of age and there was no charge to attend. They took place in summer and winter in order that participants could experience driving in different weather and light conditions.

The course consisted of both theory and practice:

- Theory: thorough revision of The Highway Code and teaching of good driving practice to reduce the risk of collisions. The theoretical part was undertaken by the City Police and professional driving instructors from the Modena Autodrome.
- Practice: driving on the Autodrome accompanied by a professional driving instructor.

The theoretical part was divided into two sessions: the first focused on a comprehensive review of The Highway Code including an update on new European regulations and traffic signs. It also included measures to take in case of a collision e.g. accident reports, liability and the consequences of failing to provide assistance to the police. This session was held by a City Police Commissioner. The second part focused on road safety and covered good driving practice, car equipment for winter driving e.g. snow chains and winter tyres and the correct way to operate the controls.

The practical part was held by professional driving instructors who explained how to correct the most common mistakes made by elderly drivers and this was followed by a hands-on test drive on the road.

The driver training courses were organised by the City Police of Modena and were attended by 20 people aged over 65 years.

Feedback from participants

- The positive side lies in the high enjoyment rate of the course, as recorded on the participants' completed evaluation forms. They stated that receiving an update on The Highway Code was quite important because they had forgotten much of it and were unaware of recently introduced regulations.
- The practical driving session was quite successful among the participants because it allowed them to correct common mistakes that had developed over many years of driving.
- The participants asked for further courses every few years to provide an update on The Highway Code and to take part in further hands-on driving tuition with a qualified instructor. They suggested that more time should be allocated to hands-on driving tuition in future courses.
- A negative issue was that, even though the event appeared to be well liked during the enrolment stage, the number of participants halved when it came to actually attending the courses. This was disappointing because they had been specifically

designed for the numbers that had enrolled in order to provide sufficient time for individual tuition during the hands-on driving sessions.

The driving course experience for active senior citizens stands out as a new initiative in Italy. At the present time, Italian law does not require older drivers to take another driving test when they reach a specific age and it was felt that this caused the initiative to be undervalued by some potential applicants.

Work Package 7 – Communication

Actions 7.11-7.14: Communication

Table 38 - Partner Meetings

Ref No	Date	Venue
1	26/10/10 27/10/10	Kick-Off meeting, Civic Centre, Southend (UK) Partner meeting , Civic Centre, Southend (UK)
2	08/04/11	East of England Partnership Office, Brussels (BE)
3	07/10/11	Commerce House, Lancaster (UK)
4	01/12/11	East of England Partnership Office, Brussels (BE)
5	29/03/12	Comune di Modena, Modena (IT)
6	14/06/12 15/06/12	IFSTTAR Laboratory,Versailles (FR) IFSTTAR, Versailles (FR)
7	27/09/12	Officina de Captación de Inversiones, Burgos (ES)
8	17/01/13	Technische Universität Dresden, Dresden (DE)
9	06/03/13	The Park Inn Palace, Southend (UK)

Table 39 - Presentations to Public Audiences

Ref No	Date	Venue
1	22/09/09	South Essex College, (formely South East Essex College) Southend, (UK)
2	29/04/10	Polis Safety & Security Working Group, Brussels, (BE)
3	18/11/10	Civic Centre, Southend, Kick-Off meeting, (UK)
4	10/05/11	Tickfield Centre, Southend, (UK)
5	08/06/11	West Midlands Road Safety Liaison Group, Birmingham, (UK)
6	29/11/11	Polis Annual Conference, Brussels, (BE)
7	30/03/12	Public Meeting, Modena, (IT)
8	31/05/12	Chartered Institution Highways & Transportation, London, (UK)
9	22/06/12	CIT 2012 Congreso de Ingeniería, Granada, (ES)
10	25/06/12	12ème colloque international sur le vieillissement cognitifs, Tours, (FR)
11	13/08/12	World congress on Active Ageing, (Poster) , Glasgow, (UK)
12	29/11/12	Polis Annual Conference, Perugia, (IT)
13	07/03/13	Final Conference, Southend, (UK)
14	17/06/13	CIHT Society of Road Safety Auditors, Birmingham, (UK)

Papers published in the professional press
'Looking closely at the needs of elderly drivers and pedestrians across Europe' Transport Professional Magazine, Paul Mathieson, Southend-on-Sea Borough Council & Adrian Dean, Atkins.

Final conference and Final Report

The final conference was held on 7th March 2013 at The Park Inn Palace Hotel, Southend-on-Sea (UK) and was attended by 83 people. Those attending included representatives from the following groups and organisations:

- SaMERU partners

- The Mayor and councillors of Southend-on-Sea Borough Council
- Representatives from the following local authorities; Blackburn with Darwen Council, Essex County Council, Blackpool Council, Lancashire County Council, Medway Council, Norfolk County Council, Suffolk County Council, Thurrock Council
- Transport for London
- TRL (Transport Research Laboratory)
- Older People's Assembly, (OPA) Southend
- Age UK
- CIHT (Chartered Institution of Highways & Transportation)
- Mobility 4 U
- Polis
- University of Central Lancashire
- Representatives from Public Health and the National Health Service, bus user group,

Exhibitors included the following:

- Mobility 4 U – suppliers of mobility scooters
- Cycle Southend Team – an electric bike was displayed. The Cycle Southend Team is also a partner in the EU project 'Bike Friendly Cities'.
- GERT suit - the acronym is derived from GERontologic Test suit. The real Gert Weller, of the Technical University of Dresden, explained its function, which is to demonstrate the effect of ageing on various parts of the human body to people who have not yet reached their later years.

Following a welcome speech by The Mayor of Southend, Cllr. Sally Carr, a number of presentations were given by eminent speakers:

- Why is SaMERU important? – Cllr. Tony Cox, Portfolio Holder for Public Protection, Waste & Transport
- Older road user casualties: International data analysis for effective strategic planning – Dr Gert Weller, Technische Universität Dresden
- Psychological factors influencing the safety and mobility of elderly road users – Dr Isabelle Tournier, IFSTTAR
- Elderly drivers: 'dangerous or endangered?' – Professor Dr Bernhard Schlag, Technische Universität Dresden
- SaMERU training course development: reducing risk and maintaining independence – Jackie Brindle, Lancashire County Council
- Driver training courses in Modena – Dr Andrea Piselli, Sicurezza Stradale della Polizia Municipale di Modena.
- Role of the Older People's Assembly in SaMERU – Derek Iles, Chairman of OPA
- How a sustainable approach can benefit the elderly road user – Professor Stephen Stradling, Emeritus Professor of Transport Psychology, Edinburgh Napier University

The conference included three workshops each of 30 minutes duration:

- Workshop 1: Linking mobility and health in policy and practice
- Workshop 2: Effective partnership working
- Workshop 3: Delivering effective training and targeted messages

These interactive workshops included all delegates and partners. Those attending were asked to consider three questions:

- What needs to be considered to deliver this?
- Who needs to be involved?
- What can you do to help deliver this?

The results of the workshops were presented in summary at the conference. The comments covered a wide range of topics but the following key messages were received:

- More priority should be given to collecting information on collisions e.g. injury data from hospitals
- Importance of medical tests for drivers
- Mobility training should be undertaken by the elderly well before cessation of driving
- There is a need for a broader range of professional services to become involved in mobility issues and fitness to drive for the elderly e.g. doctors, opticians, pharmacists, car manufacturers
- Improved driver awareness of the issues facing older road users
- The importance of well maintained and unobstructed footways
- Educating older people about how PUFFIN crossings work
- The fear of falling is a deterrent to older people venturing outside
- Street design that benefits the elderly
- Reaching elderly isolated people
- Communication via the internet does not always reach elderly people

Following the workshops all delegates were invited to a question and answer session. Approximately half the questions related to collisions e.g. the higher collision rate for older women, single vehicle collisions, the higher risk of collisions in continental Europe and the impact of medication and alcohol on driving. Other issues raised were;

- Benefits of driver and pedestrian training for the elderly
- Psychological and health issues associated with driving
- Why promote cycling when cycling collisions are increasing?
- PUFFIN crossing design
- Driving tests for the over 70's

Key issues from the conference

- How can we test people to see whether they are still fit to drive?
- Driver and mobility training should be encouraged
- Health practitioners, family and friends should try to ensure that people only drive when they are fit to do so
- Infrastructure design should be more age-friendly, more public benches and toilets

A full report on the SaMERU conference may be found by visiting www.sameru.eu

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